

WHITMAN™ CONTROLS

ISO 9001:2015 Certified



Food Processing / HVAC & Boiler / Manufacturing / Oil-Gas / Medical Devices / Water & Waste Water



Whitman Controls is an established leader in the manufacture of miniature pressure, vacuum, temperature, and liquid level switches.



Whitman Controls is a leader in the pressure, vacuum, temperature, and liquid level switch industry, a position we have held for over 40 years. The Whitman Value is built on our differentiated offering of high quality switches, and the ability to deliver product to EXACT customer specifications in two weeks or less. Off the shelf switches limit an application's functionality and versatility; Why choose a competitor switch that results in inferior performance? We take into account your application and media environment, as well as all desired specifications to design a switch that will meet performance needs and exceed your expectations. High quality switches, designed to customer specifications in two weeks or less, with an unrelenting focus on superior service – Together they add up to the Whitman Value.

Diversified Product Offering – More Choices and More Savings.

We offer the most extensive pressure, vacuum, temperature and liquid level switch selection in the industry. What does this mean for you? The ability to identify a switch that is suited perfectly for your application at a price that doesn't break your budget. At Whitman, we are constantly evaluating our input prices to identify savings we can pass along directly to the buyer. And we do all of this without sacrificing performance and quality.

Numerous Choices and Additional Options – Have it your Way.

Need additional wire on top of the 12" standard offering? Looking for a 1/4" NPT fitting instead of 1/8" NPT? Need Teflon tape or Loctite Vibraseal on your fitting? These are just a few of the numerous additional options that are available to customers on all our switch offerings. You have a need and we have an answer. All our switches can be customized to meet any end-user requirements.

Experience and Knowledge, That's Invaluable.

Whitman Controls directs its years of design and manufacturing experience toward providing value-added services to our customers. These services can help you lower costs and increase efficiency. Our engineering team will work intimately with you and your team to design a switch that will maximize application performance no matter what the environment. In addition, our exceptional mechanical abilities allow us to perform additional assemblies and deliver more complete tested systems and subassemblies.

ISO 9001 Certified – We Hold Ourselves, and Our Products, to the Highest Standards.

Whitman Controls is ISO 9001:2015 Certified, which gives our customers the confidence that we hold our internal processes, and products, to the highest standards of quality and rigorous testing requirements. You can be confident that the product you receive has met all necessary regulatory requirements and will outperform your desired expectations.

Ongoing investment in research and development ensure we stay on the leading edge of switch technology while consistently offering new models to meet the demands of any application. ***Plus we do it all at a price that will save you money.***

We appreciate your interest in our line of products, and are confident that our switch performance will meet your application requirements and exceed your expectations.

Quality products, fully customizable, with a commitment to superior service. Together they add up to the Whitman Value.

Pressure Switches	4	Liquid Level Switches	39
Pressure Switch Selection Guide	5	Liquid Level Switch Information.....	40
Part Number Construction	6	Liquid Level Switch Selection Guide	41
P88G Economical Pressure Switch	7	L10 Vertical Brass Buna Temperature-Level Switch.....	42
P90 Severe Environment Pressure Switch	8	L20/L25 Side Mounted Stainless Steel Liquid Level Switch.....	43
P95 High Pressure Severe Environment Pressure Switch	9	L20/L25 Side Mounted CPVC Plastic Liquid Level Switch	44
P100G High Accuracy Low Pressure Environment Pressure Switch	10	L20/L25 Side Mounted Kynar Plastic Liquid Level Switch	45
P117G Stainless Steel Miniature Pressure Switch.....	11	L20/L25 Side Mounted Polypropylene Liquid Level Switch.....	46
P117LG NEMA 4 Stainless Steel Pressure Switch	12	L30 Vertical Multi-Station Stainless Steel Liquid Level Switch.....	47
W117G Ultra Pure Stainless Steel Pressure Switch.....	13	L30 Vertical Multi-Station Brass Buna Liquid Level Switch	48
W117LG NEMA 4 Ultra Pure Stainless Steel Pressure Switch	14	L31 Heavy Duty Vertical Multi-Station Stainless Steel Liquid Level Switch	49
P119G Zinc Diecast Body Pressure Switch	15	L40 Vertical Mount 1” Cylinder Stainless Steel Liquid Level Switch	50
J205G High Pressure Low Set Point Pressure Switch.....	16	L40 Vertical Mount 1” Sphere Stainless Steel Liquid Level Switch	51
J205LG NEMA 4 High Pressure Low Set Point Pressure Switch	17	L40 Vertical Mount Brass / Buna Liquid Level Switch.....	52
P605 High Pressure High Set Point High Accuracy Pressure Switch	18	L40 Vertical Mount CPVC Plastic Liquid Level Switch	53
P605L High Pressure High Set Point High Accuracy Pressure Switch	19	L40 Vertical Mount Kynar Plastic Liquid Level Switch.....	54
J705 High Pressure High Set Point Pressure Switch.....	20	L40 Vertical Mount Polypropylene Liquid Level Switch.....	55
J705L NEMA 4 Economical High Pressure High Set Point Pressure Switch	21	L54/L55 Bent Stem Side Mount Stainless Steel Liquid Level Switch	56
Vacuum Switches	22	L60 Heavy Duty Vertical Mount 2” Sphere Stainless Steel Liquid Level Switch.....	57
Vacuum Switch Selection Guide.....	23	L60 Heavy Duty Vertical Mount Brass / Buna Liquid Level Switch	58
Part Number Construction	24	L70 Mini Polypropylene Vertical Mount Liquid.....	59
P88V Economical Vacuum Switch.....	25	Temperature Switches & Thermostats	60
P100V High Accuracy Low Vacuum Environment Vacuum Switch	26	T150D Adjustable Stainless Steel Miniature Temperature Switch	61
P117V Stainless Steel Miniature Vacuum Switch	27	L10 Vertical Brass Buna Temperature-Level Switch	62
P117LV NEMA 4 Stainless Steel Vacuum Switch.....	28	TP Series Economical Stainless Steel Temperature Probe Switch	63
W117V Ultra Pure Stainless Steel Vacuum Switch	29	T3 Economical Stainless Steel Thermostat	64
W117LV NEMA 4 Ultra Pure Stainless Steel Vacuum Switch.....	30	General Information	65
P119V Zinc Diecast Body Vacuum Switch	31	Electrical Switch Codes	66
J205V High Pressure Vacuum Set Point Vacuum Switch	32	Electrical Interface Options.....	67
J205LV NEMA 4 High Pressure Vacuum Set Point Vacuum Switch	33	Fittings, Adapters, and Optional Parts	68
Compound Switches	34	Set Point Adjustments & Wiring Instructions.....	69
P88C Economical Compound Switch	35	Switch Glossary	70
P100C High Accuracy Compound Switch	36	Whitman Value.....	71
Differential Switches	37		
P845 Differential Pressure Switch.....	38		

PRESSURE SWITCHES

We manufacture a wide range of pressure switches to meet the needs of any industrial application and operating environment. Our preset switches are set at the factory to the specifications and parameters to fit our customers' requirements. Our field adjustable switches allow our customers the flexibility of easily setting the switch parameters in the field as driven by the needs of the project.

	Pressure Switch Selection Guide	5
	Part Number Construction	6
P88G	Economical Pressure Switch	7
P90	Severe Environment Pressure Switch	8
P95	High Pressure Severe Environment Pressure Switch	9
P100G	High Accuracy Low Pressure Environment Pressure Switch	10
P117G	Stainless Steel Miniature Pressure Switch	11
P117LG	NEMA 4 Stainless Steel Pressure Switch	12
W117G	Ultra Pure Stainless Steel Pressure Switch	13
W117LG	NEMA 4 Ultra Pure Stainless Steel Pressure Switch	14
P119G	Zinc Diecast Body Pressure Switch	15
J205G	High Pressure Low Set Point Pressure Switch	16
J205LG	NEMA 4 High Pressure Low Set Point Pressure Switch	17
P605	High Pressure High Set Point High Accuracy Pressure Switch	18
P605L	NEMA 4 High Pressure/Set Point/Accuracy Pressure Switch	19
J705	High Pressure High Set Point Pressure Switch	20
J705L	NEMA 4 Economical High Pressure/Set Point Pressure Switch	21



Pressure Switch Selection Guide

The chart below gives an overview of our pressure switch product catalog at Whitman, and the functionality of each of our switches. Depending on your desired set point, and maximum system pressure, you will find a switch that will meet your specific needs and exceed your expectations.

SPECIFICATIONS

	P88G	P90	P95	P100G	P117G / P117LG	P119G	W117G / W117LG	J205G / J205LG	P605 / P605L	J705 / J705L
Minimum Set Point (PSIG)	1.5	0.75	0.75	0.10	0.80	0.80	0.80	0.80	400	500
Maximum Set Point (PSIG)	500	400	400	15.0	500	500	500	800	6,000	6,000
Maximum System Pressure (PSIG)	600	600	4,000	15	500	500	500	5,000	6,000	6,000
Proof Pressure (PSIG)	600	600	4,000	20	750	750	750	5,000	9,000	9,000

Steps Required for Identifying the Right Pressure Switch for your Application:

- Step 1:** Identify the Maximum System Pressure on your Application
- Step 2:** Identify your Set Point and if on “Increasing” or “Decreasing” pressure
- Step 3:** Select a Sensor Code that applies to the Maximum System Pressure and Set Point Range desired for your application – Reference Table A on the corresponding Switch Page
- Step 4:** Determine your Set Point Option: C-set (Customer set, field adjustable), K-set (Factory pre-set to customer specifications, field adjustable), F-set (Factory set, non-adjustable)
- Step 5:** Select your Electrical Amperage and Contact Selection – Reference Electrical Switch Tables
- Step 6:** Select your Electrical Interface – Reference Electrical Interface Options
- Step 7:** Select your Wire Length if longer than 12” (Standard) is desired
- Step 8:** Confirm Wetted Materials are compatible with Fluid and Environment
- Step 9:** Select Additional Options – Reference Additional Options or Consult Factory

Please refer to our website at www.whitmancontrols.com for additional information or contact our engineering department at engineering@whitmancontrols.com.

Limitation of Application Liability:

Whitman Controls Corporation assumes the buyer to be expert in the intended application of Whitman Controls’ products. Whitman Controls claims no special expertise in the application of its products in the buyer’s equipment. Whitman Controls accepts no responsibility for the buyer’s selection and use of Whitman Controls products. Buyer’s interpretation and implementation of application suggestions and recommendations by Whitman Controls, general or specific, transmitted verbally or in writing, published or unpublished, is strictly at the buyer’s own risk.

Terms and Conditions:

All sales FOB Bristol, CT prepaid and added to the invoice. All prices net. Prices and specifications are subject to change without notice. Terms with established credit are net 30 days. Returns will not be accepted without a return authorization number issued by Whitman Controls. A 30% restocking fee will be charged on all items returned unless merchandise shipped was due to a Whitman Controls error.

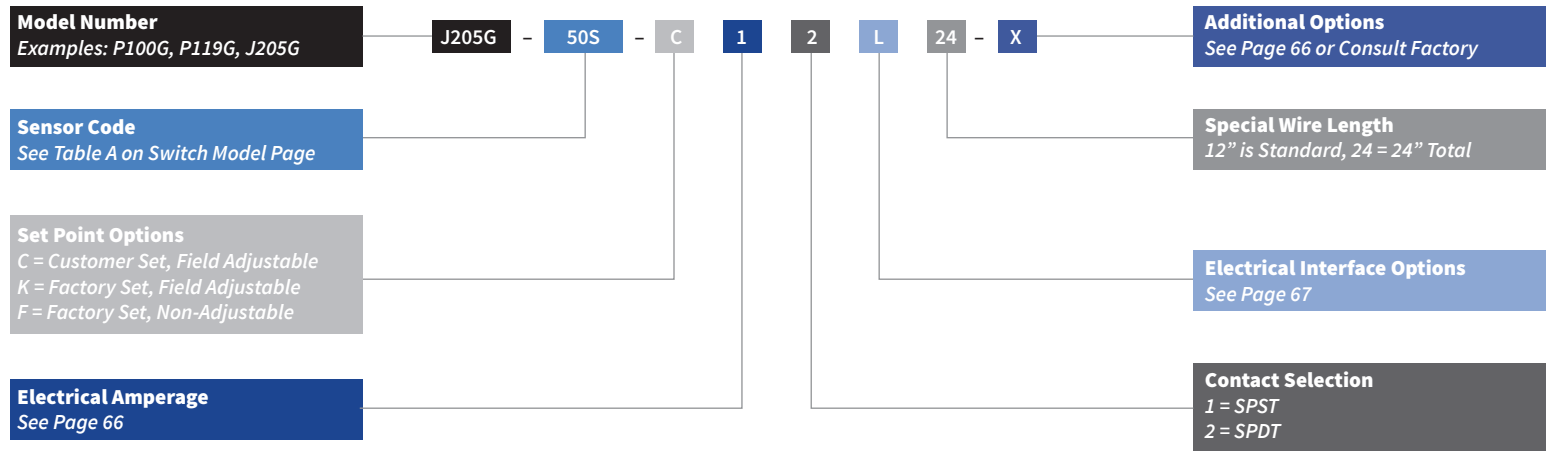
International Terms and Conditions:

All sales FOB Bristol, CT. Payment prepaid in U.S. Dollars, on a U.S. Bank or by electronic transfer to a Whitman Controls banking institution.

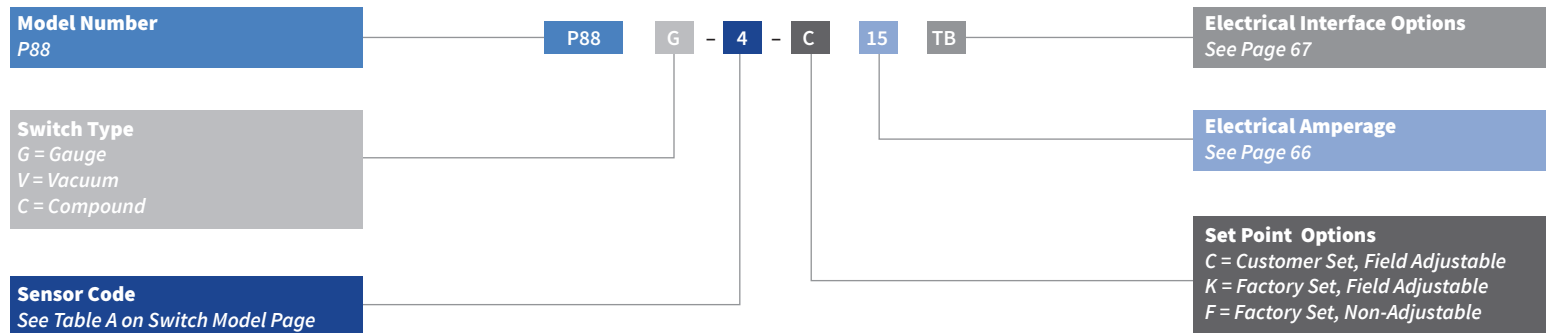
Three Year Limited Warranty

The proven quality and reliability of Whitman Controls Corporation Pressure, Vacuum, Liquid Level, and Temperature Switches are backed by our 3 Year Limited Warranty when used in normal operation. Our complete warranty statement is provided with all quotations or is available on request.

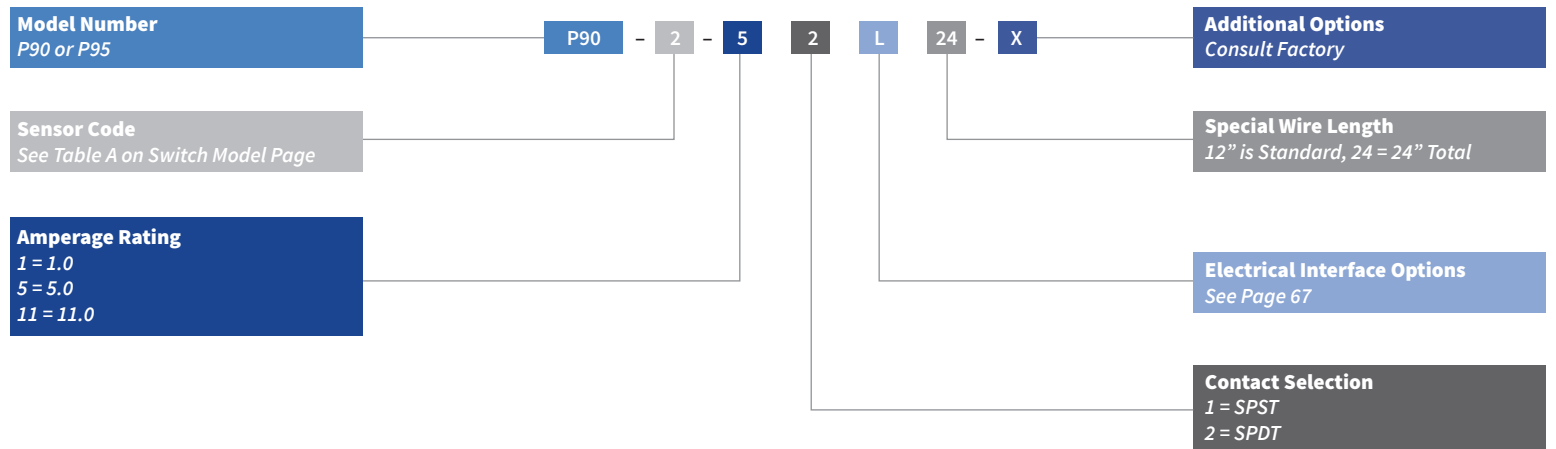
All Pressure, Vacuum and Compound Switch Models Except P88, P90, P95



P88 Pressure, Vacuum, Compound Switches



P90 / P95 Pressure Switch

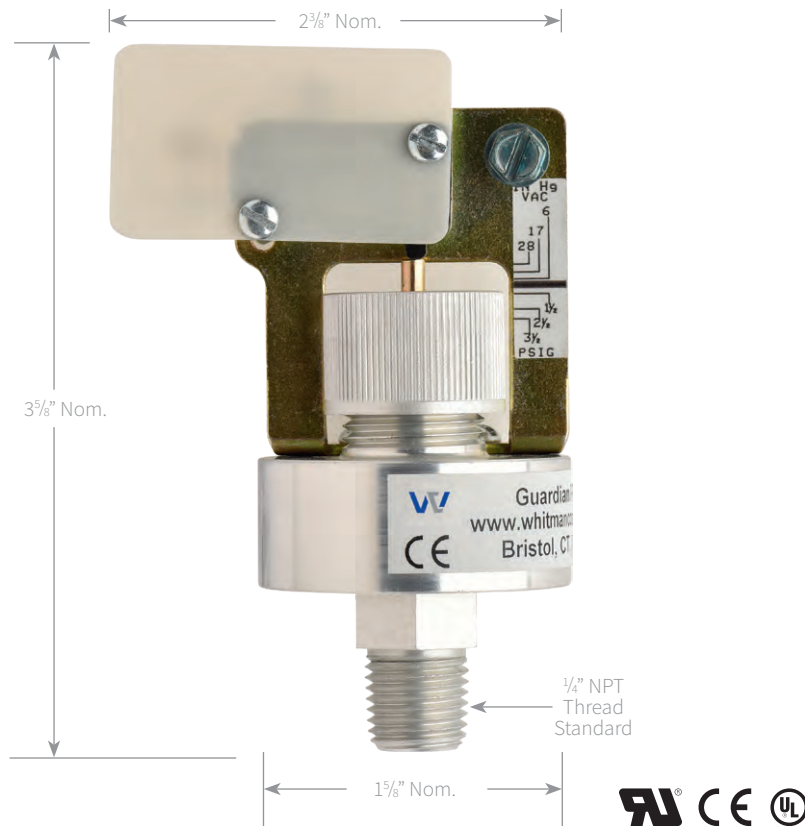


P88G

Economical Pressure Switch

OVERVIEW

The Whitman Controls P88G Economical Pressure switches are typically used in applications where reliable switch control supersedes accuracy of set point. These switches can be used in dry indoor applications or placed within an enclosure. Controlling on and off functions for fans and pumps where one may need a wide differential to prevent over-cycling is an ideal application use for the P88G.



KEY FEATURES

- Consistent switch control
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range

SPECIFICATIONS

- **Set point Range:** 1.5 to 500 PSIG
- **Max System Pressure:** 600 PSIG
- **Temperature Range:** -31°F to +185°F (-35°C to +85°C)
- **Amps:** 1-25 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.4 oz
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: Buna N and Brass
 Seal: Loctite #271
 Body with Fitting: Zinc alloy, chromate finish
 Optional Thread: 1/4-18 BSPT male, 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE
	PSIG	PSIG	PSIG
3	600	± 0.15	1.5 - 3.5
4	600	± 1.0	3.0 - 40.0
5	600	± 5.0	30.0 - 150.0
6	600	± 20.0	100.0 - 500.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P90

Severe Environment Pressure Switch

OVERVIEW

The Whitman Controls P90 Severe Environment Pressure switches are built to operate in harsh conditions and are typically used in vehicle applications both off road and on. As these switches are NEMA 6 rated, they are weather proof and briefly submersible. Ideal use is on log skidders, tractors, handi-vans, cranes and numerous other applications where shock, vibration and weather are of primary concern.

KEY FEATURES

- Shock resistant up to 150G
- Vibration durability of 10Hz to 2,000Hz @ 10G's
- Water resistant up to 1,000 PSIG high pressure spray
- Cold Storage up to -67°F (-55°F)
- NEMA 6 Rated: Weather-proof and briefly submersible
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 0.75 to 400 PSIG
- **Max System Pressure:** 600 PSIG
- **Temperature Range:** -40°F to +257°F (-40°C to +125°C)
- **Amps:** 1-11 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.0 oz
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:**
 Diaphragm: Viton
 Lower Body: Zinc alloy, chromate finish
 Standard Thread: 1/8" NPT
 Optional Threads: 12-20 SAE, other fittings available in quantities



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
1	600	± 0.75	0.75 - 3.0	2.0 - 4.25
2	600	± 1.0	3.0 - 6.0	4.2 - 8.0
3	600	± 2.0	6.0 - 20.0	7.0 - 24.0
4	600	± 5.0	12.0 - 47.0	14.0 - 50.0
5	600	± 10.0	30.0 - 110.0	38.0 - 125.0
6	600	± 20.0	75.0 - 270.0	85.0 - 270.0
7	600	± 40.0	100.0 - 330.0	125.0 - 400.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P95

High Pressure Severe Environment Pressure Switch

OVERVIEW

The Whitman Controls P95 Severe Environment Pressure switches are built to operate in harsh conditions and are typically used in vehicle applications both off road and on. As these switches are NEMA 6 rated, they are weather proof and briefly submersible. Resiliency in high pressure conditions is the key differentiator relative to its P90 sister switch, with the ability to withstand hydraulic spikes to 4,000 psig. Ideal use is on log skidders, tractors, cranes and numerous other applications where pressure spikes, shock, vibration and weather are of primary concern.

KEY FEATURES

- Ability to withstand hydraulic spikes to 4,000 psig
- Shock resistant up to 150G
- Vibration durability of 10Hz to 2,000Hz @ 10G's
- Water resistant up to 1,000 PSIG high pressure spray
- Cold Storage up to -67°F (-55°F)
- NEMA 6 Rated: Weather-proof and briefly submersible
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range

SPECIFICATIONS

- **Set Point Range:** 0.75 to 400 PSIG
- **Max System Pressure:** 4000 PSIG
- **Temperature Range:** -40°F to +257°F (-40°C to +125°C)
- **Amps:** 1-11 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.0 oz
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:**
Diaphragm: Viton
Lower Body: 303 Stainless steel
Standard Thread: 1/8" NPT
Optional Threads: 12-20 SAE, other fittings available in quantities



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
1	4000	± 0.75	0.75 - 3.0	2.0 - 4.25
2	4000	± 1.0	3.0 - 6.0	4.2 - 8.0
3	4000	± 2.0	6.0 - 20.0	7.0 - 24.0
4	4000	± 5.0	12.0 - 47.0	14.0 - 50.0
5	4000	± 10.0	30.0 - 110.0	38.0 - 125.0
6	4000	± 20.0	75.0 - 270.0	85.0 - 270.0
7	4000	± 40.0	100.0 - 330.0	125.0 - 400.0

*Exceeding sensor capacity may cause shift in set point

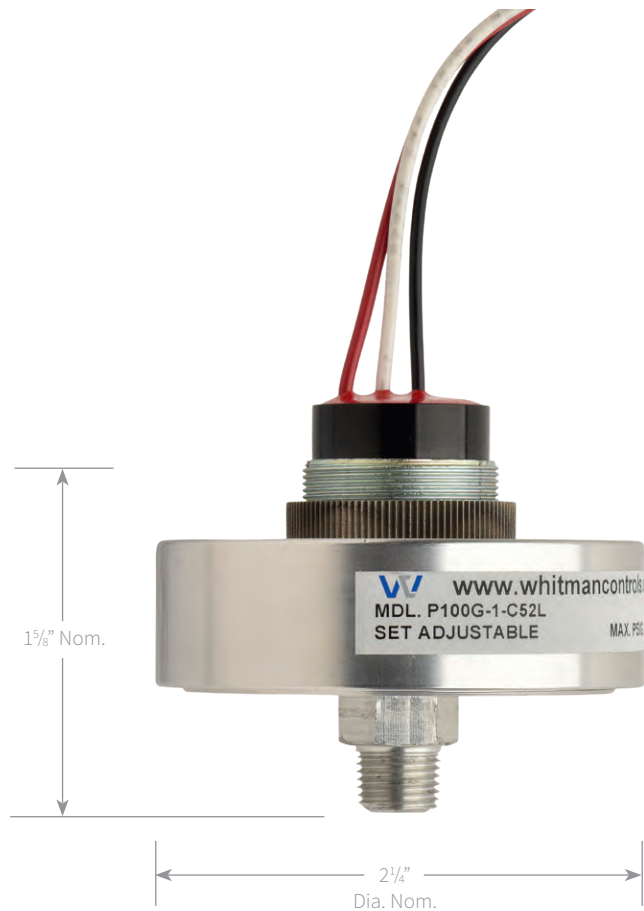
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P100G

High Accuracy Low Pressure Environment Pressure Switch

OVERVIEW

The Whitman Controls P100G High Accuracy Low Pressure Environment Pressure switches are ideal in light pressure applications where precision of setpoint must be high and repeatability low. These switches are commonly used in natural gas well heads, natural gas generator sets, and air applications like forced draft blowers. The P100G can be used both in dry indoor applications or within an enclosure.



KEY FEATURES

- Highly accurate setpoints and repeatability
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** See Table A
- **Max System Pressure:** 15 PSIG
- **Temperature Range:** -65°F to +190°F (-54°C to +88°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.8 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: Buna N with 316 stainless steel reinforcing
 Seal: Loctite #271
 Body: Anodized aluminum
 Standard Thread: 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A						Table B					
	MAXIMUM SYSTEM PRESSURE*			SET POINT REPEATABILITY			SET POINT RANGE					
	PSIG	Inches Hg	Inches H ₂ O	PSIG	Inches Hg	Inches H ₂ O	DECREASING			INCREASING		
						PSIG	Inches Hg	Inches H ₂ O	PSIG	Inches Hg	Inches H ₂ O	
1	15.0	-	-	± 0.03	-	-	0.10 - 14.27	-	-	0.15 - 15.0	-	-
1	-	30.54	-	-	± 0.06	-	-	0.21 - 29.06	-	0.31 - 30.54	-	-
1	-	-	415.2	-	-	± 0.8	-	-	2.75 - 395.03	-	-	4.15 - 415.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P117G

Stainless Steel Miniature Pressure Switch

OVERVIEW

The Whitman Controls P117G Stainless Steel Miniature Pressure switches are sharp, highly versatile devices that can be used in hundreds of OEM and routine mechanical applications. There are numerous fitting and electrical connection options available including TB, TS, Military, and DIN Connectors.

KEY FEATURES

- Miniature size
- Stainless steel body
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 0.80 to 500 PSIG
- **Proof Pressure:** 150% of sensor capacity
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule
- **Weight:** 3.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H/25H/50H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH
 Seal: Loctite #271
 Fitting: 303 Stainless steel
 Standard Thread: 1/8-27 NPT male
 Optional Threads: 1/4-18 NPT male
 7/16-20 UNF male



(Shown with TB Interface)

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
3H	30	± 0.6	0.8 - 3.0	1.6 - 30.0
5H	50	± 1.0	2.0 - 48.0	3.0 - 50.0
10H	100	± 2.0	3.0 - 96.5	4.5 - 100.0
25H	250	± 5.0	7.5 - 242.5	9.7 - 250.0
50H	500	± 10.0	15.0 - 485.0	20.0 - 500.0

*Exceeding sensor capacity may cause shift in set point
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P117LG

NEMA 4 Stainless Steel Pressure Switch

OVERVIEW

The Whitman Controls P117LG NEMA 4 Stainless Steel Pressure Switches are the weather-proof, liquid-resistant version of the P117G. The NEMA 4 rating makes these rugged switches suitable for outside applications or in areas of condensing humidity. Unlike the P117G, the P117LG set point is factory set to customer specification and is non-adjustable. Numerous fitting options are available.

KEY FEATURES

- NEMA 4 Rated
- Stainless steel body
- Weather-proof, liquid resistant
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 0.80 to 500 PSIG
- **Proof Pressure:** 150% of sensor capacity
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule
- **Weight:** 3.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H/25H/50H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH
 Seal: Loctite #271
 Fitting: 303 Stainless steel
 Standard Thread: 1/8-27 NPT male
 Optional Threads: 1/4-18 NPT male, 7/16-20 UNF male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A		Table B	
	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
3H	30	± 0.6	0.8 - 3.0	1.6 - 30.0
5H	50	± 1.0	2.0 - 48.0	3.0 - 50.0
10H	100	± 2.0	3.0 - 96.5	4.5 - 100.0
25H	250	± 5.0	7.5 - 242.5	9.7 - 250.0
50H	500	± 10.0	15.0 - 485.0	20.0 - 500.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

W117G

Ultra Pure Stainless Steel Pressure Switch

OVERVIEW

The Whitman Controls W117G Ultra Pure Stainless Steel Pressure Switches have all welded stainless steel interiors which are Helium leak checked to pass 4 x 10⁻⁹ Std CC/Sec. These switches are used in silicon wafer ovens, numerous medical devices and other applications where even the slightest impurities are not tolerated. There are a number of fitting options available featuring the 1/4" VCR Male and many interface options to fit any application.

KEY FEATURES

- High purity
- Welded stainless steel body and interiors, helium leak checked
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 0.80 to 500 PSIG
- **Proof Pressure:** 150% of sensor capacity
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Electric beam welded, helium leak tested
- **Weight:** 3.0 oz (approx.)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H/25H/50H – Not to exceed 20 CPM
- **Wetted Parts:**
Capsule: 17-7 PH, electron beam welded
Fitting: 303 Stainless steel
Standard Thread: 1/8-27 NPT male
Optional Threads: 1/4 VCR male, 1/4-18 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING	INCREASING
3H	30	± 0.6	0.8 - 28.5	1.6 - 30.0
5H	50	± 1.0	2.0 - 48.0	3.0 - 50.0
10H	100	± 2.0	3.0 - 96.5	4.5 - 100.0
25H	250	± 5.0	7.5 - 242.5	9.7 - 250.0
50H	500	± 10.0	15.0 - 485.0	20.0 - 500.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

W117LG

NEMA 4 Ultra Pure Stainless Steel Pressure Switch

OVERVIEW

The Whitman Controls W117LG NEMA 4 Ultra Pure Stainless Steel Pressure Switches have all welded stainless steel interiors which are Helium leak checked to pass 4 x 10⁻⁹ Std cc/sec. These are the NEMA 4 rated weather-proof, liquid-resistant version of the W117G, suitable for outside applications or in areas of condensing humidity. These switches are used in silicon wafer ovens, numerous medical devices, and other applications where even the slightest impurities are not tolerated.

KEY FEATURES

- High purity
- NEMA 4 Rated
- Stainless steel body and interior, helium leak checked
- Weather-proof and liquid-resistant
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 0.80 to 500 PSIG
- **Proof Pressure:** 150% of sensor capacity
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule – Electric beam welded, helium leak tested
- **Weight:** 3.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H/25H/50H – Not to exceed 20 CPM
- **Wetted Parts:**
Capsule: 17-7 PH, electron beam welded
Fitting: 303 Stainless steel
Standard Thread: 1/8"-27 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A		Table B	
	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING	INCREASING
3H	30	± 0.6	0.8 - 28.5	1.6 - 30.0
5H	50	± 1.0	2.0 - 48.0	3.0 - 50.0
10H	100	± 2.0	3.0 - 96.5	4.5 - 100.0
25H	250	± 5.0	7.5 - 242.5	9.7 - 250.0
50H	500	± 10.0	15.0 - 485.0	20.0 - 500.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P119G

Zinc Diecast Body Pressure Switch

OVERVIEW

The Whitman Controls P119G Zinc Diecast Body Pressure Switches are the inexpensive version of the P117G and recommended for indoor OEM use. It is used as a pressure limit switch on X-Ray tubes and Cat Scan Tubes as well as a safety switch in numerous applications. The compact nature of these switches make them ideal for tight spaces. They are available with a cast in 1/4" NPT fitting as an option. There are also several electrical interface options available.

KEY FEATURES

- Zinc Diecast Body
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 0.80 to 500 PSIG
- **Proof Pressure:** 150% of sensor capacity
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule
- **Weight:** 2.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H/25H/50H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH
 Seal: Loctite #271
 Body with Fitting:
 Round body – Zamac 3, chromate finish
 Hex body – ZA8, chromate finish
 Standard Thread: 1/8"-27 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A		Table B	
	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
3H	30	± 0.6	0.8 - 3.0	1.6 - 30.0
5H	50	± 1.0	2.0 - 48.0	3.0 - 50.0
10H	100	± 2.0	3.0 - 96.5	4.5 - 100.0
25H	250	± 5.0	7.5 - 242.5	9.7 - 250.0
50H	500	± 10.0	15.0 - 485.0	20.0 - 500.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

J205G

High Pressure Low Set Point Pressure Switch

OVERVIEW

The Whitman Controls J205G High Pressure Low Set Point Pressure Switches are among our most versatile offering, affording the end user an extensive operating environment and a wide range of set point optionality. These switches can be exposed to high pressure without compromising integrity or switch functionality. Uses include gas bottle change switches and oil or water supply control. They are frequently used in pump and reservoir applications. The internals are stainless steel with a diaphragm O-ring that is available in numerous compounds.

KEY FEATURES

- Overpressure feature, allowing the switch to be subject to high pressure without compromising integrity
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability
- Wide range of set point optionality

SPECIFICATIONS

- **Set Point Range:** 0.80 to 800 PSIG
- **Max System Pressure:** 5,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 4.0 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: 316 Stainless steel
 Seal: Loctite #271
 Body/Fitting: 303 Stainless steel
 O-Ring: Buna N Standard (Special material available upon request)
 Standard Thread: 1/8-27 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A			Table B	
	MAXIMUM SET POINT	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
2S	20	5000	± 0.8	0.8 - 16.3	1.2 - 20.0
5S	50	5000	± 2.0	2.0 - 42.5	2.0 - 50.0
10S	100	5000	± 4.0	4.0 - 91.0	4.0 - 100.0
25S	250	5000	± 10.0	10.0 - 222.0	10.0 - 250.0
50S	500	5000	± 20.0	20.0 - 432.0	20.0 - 500.0
80S	800	5000	± 40.0	50.0 - 700.0	100.0 - 800.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

J205LG

NEMA 4 High Pressure Low Set Point Pressure Switch

OVERVIEW

The Whitman Controls J205LG NEMA 4 High Pressure Low Set Point Pressure Switches are among our most versatile offering, affording the end user an extensive operating environment and a wide range of set point optionality. These switches can be exposed to high pressure without compromising integrity or switch functionality. The J205LG is the NEMA 4 rated weather-proof, liquid-resistant version of the J205G, suitable for outside applications or in areas of condensing humidity. Uses include gas bottle change switches and oil or water supply control. They are frequently used in pump and reservoir applications. The internals are stainless steel with a diaphragm O-ring that is available in numerous compounds such as Buna (standard), Viton, Neoprene and Kalrez.

KEY FEATURES

- Overpressure feature, allowing the switch to be subject to high pressure without compromising integrity
- Weather-proof and liquid-resistant
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability
- Wide range of set point optionality
- NEMA 4 Rated

SPECIFICATIONS

- **Set Point Range:** 0.80 to 800 PSIG
- **Max System Pressure:** 5,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 4.0 oz (approx.)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: 316 Stainless steel
 Seal: Loctite #271
 Body/Fitting: 303 Stainless steel
 O-Ring: Buna N Standard, special materials available upon request
 Standard Thread: 1/8"-27 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A			Table B	
	MAXIMUM SET POINT	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
2S	20	5000	± 0.8	0.8 - 16.3	1.2 - 20.0
5S	50	5000	± 2.0	2.0 - 42.5	2.0 - 50.0
10S	100	5000	± 4.0	4.0 - 91.0	4.0 - 100.0
25S	250	5000	± 10.0	10.0 - 222.0	10.0 - 250.0
50S	500	5000	± 20.0	20.0 - 432.0	20.0 - 500.0
80S	800	5000	± 40.0	50.0 - 700.0	100.0 - 800.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P605

High Pressure High Set Point High Accuracy Pressure Switch

OVERVIEW

The Whitman Controls P605 High Pressure High Set Point High Accuracy Pressure Switches are a line of severe application controls that can withstand massive pressure spikes from hydraulic systems. These switches can see pressure spikes to 9,000 psig without comprising switch integrity or functionality. They also afford the end user higher set points to complement more severe environments and low set point repeatability. The P605 switches feature adjustable Military or DIN electrical connectors plus numerous fitting options to meet any custom design.

KEY FEATURES

- Higher set points to complement more severe environments
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability
- Extremely durable with the ability to withstand pressure spikes to 9,000 psig

SPECIFICATIONS

- **Set Point Range:** 200 to 6,000 PSIG
- **Max System Pressure:** 9,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Piston
- **Weight:** 7.0 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:**
Limp Diaphragm: Kapton
Seal: Loctite #271
O-Ring: Viton standard, Teflon available
Adapter/Fitting: 303 Stainless steel
Standard Thread: ¼-18 NPT male
Optional Threads: ⅛-27 NPT male, 7/16-20 UNF male



(Shown with DN Interface)

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
0	3000	± 25.0	200.0 - 600.0	200.0 - 600.0
1	3000	± 50.0	400.0 - 1500.0	400.0 - 1500.0
2	6000	± 150.0	1250.0 - 2750.0	1250.0 - 2750.0
3	9000	± 300.0	2750.0 - 5000.0	3500.0 - 6000.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P605L

NEMA 4 High Pressure High Set Point High Accuracy Pressure Switch

OVERVIEW

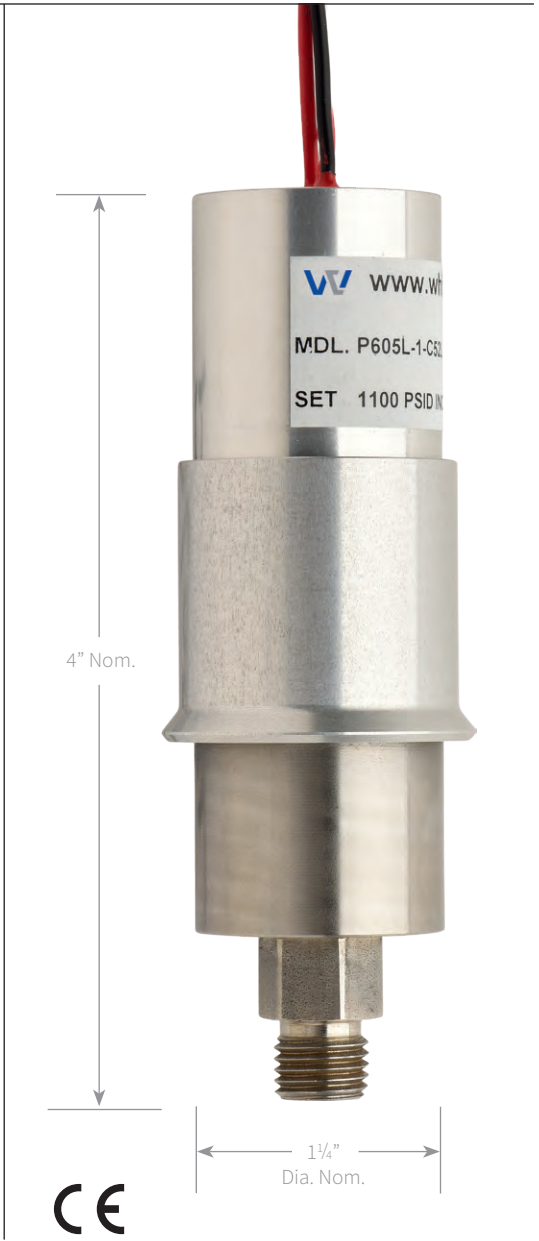
The Whitman Controls P605L NEMA 4 High Pressure High Set Point High Accuracy Pressure Switches are a line of severe application controls that can withstand massive pressure spikes from hydraulic systems. These switches can see pressure spikes to 9,000 psig without comprising switch integrity or functionality. They also afford the end user higher set points to complement more severe environments and low set point repeatability. The P605L is the NEMA 4 rated weather-proof, liquid-resistant version of the P605, suitable for outside applications or in areas of condensing humidity. The P605L switches feature adjustable Military or DIN electrical connectors plus numerous fitting options to meet any custom design.

KEY FEATURES

- Extremely durable - can withstand pressure spikes to 9,000 psig
- Higher set points to complement more severe environments
- NEMA 4 Rated
- Weather-proof and liquid resistant
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperatures
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 200 to 6,000 PSIG
- **Max System Pressure:** 9,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Piston
- **Weight:** 7.0 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:**
Limp Diaphragm: Kapton
Seal: Loctite #271
O-Ring: Viton standard, Teflon available
Adapter / Fitting: 303 Stainless steel
Standard Thread: 1/4-18 NP male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
0	3000	± 25.0	200.0 - 600.0	200.0 - 600.0
1	3000	± 50.0	400.0 - 1500.0	400.0 - 1500.0
2	6000	± 150.0	1250.0 - 2750.0	1250.0 - 2750.0
3	9000	± 300.0	2750.0 - 5000.0	3500.0 - 6000.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

J705

High Pressure High Set Point Pressure Switch

OVERVIEW

The Whitman Controls J705 High Pressure High Set Point Pressure Switches are among our most durable products, affording the end user higher set points to complement more severe environments without sacrificing set point repeatability. These switches are designed for use with various oils, waters, and assorted gases, and are resilient against impeller spikes from pumps. These switches can see pressure spikes to 9,000 psig without comprising switch integrity or functionality. They are available with several internal O-ring options, assorted fittings and electrical connectors to meet any custom application.



KEY FEATURES

- Extremely resilient with the ability to withstand pressure spikes to 9,000 psig
- High durability with higher set points to complement more severe environments
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 500 to 6,000 PSIG
- **Max System Pressure:** 6,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Piston
- **Weight:** 4.0 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:**
Piston: 17-4 PH
O-Ring: Buna N standard, special materials available upon request
Fitting: 303 Stainless steel
Standard Thread: 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
			PSIG	DECREASING PSIG
3	3000	± 25.0	500	500
		± 50.0	1000	1000
		± 75.0	1500	1500
		± 100.0	2000	2000
		± 125.0	2500	2500
		± 150.0	2800	3000
4	5000	± 45.0	600	600
		± 60.0	1000	1000
		± 85.0	1500	1500
		± 100.0	2000	2000
		± 125.0	2500	2500
		± 150.0	3000	3000
		± 175.0	3500	3500
		± 200.0	4000	4000
5	6000	± 250.0	4500	5000
		± 65.0	700	700
		± 75.0	1000	1000
		± 85.0	1500	1500
		± 100.0	2000	2000
		± 150.0	3000	3000
		± 200.0	4000	4000
± 250.0	5000	5000		
		± 300.0	5500	6000

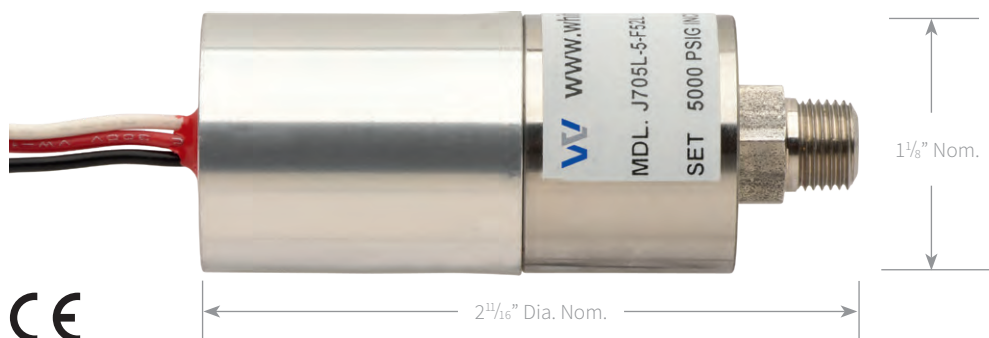
*Exceeding sensor capacity may cause shift in set point
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

J705L

NEMA 4 Economical High Pressure High Set Point Pressure Switch

OVERVIEW

The Whitman Controls J705L NEMA 4 Economical High Pressure High Set Point Pressure Switches are among our most durable switches, with the ability to withstand significant pressure spikes while affording the end user high set point optionality. These are the weather-proof, liquid-resistant version of the J705 suitable for outside applications or in areas of condensing humidity. These switches are designed for use with various Oils, Water and assorted gases. They are good with Impeller Spikes from pumps. They are available with several internal O-ring options, assorted fittings and electrical connectors.



KEY FEATURES

- Extremely resilient with the ability to withstand pressure spikes to 9,000 psig
- High durability with high set point options
- NEMA 4 Rated
- Weather-proof and liquid-resistant
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 200 to 6,000 PSIG
- **Max System Pressure:** 6,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Piston
- **Weight:** 4.0 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:** Piston: 17-4 PH
O-Ring: Buna N standard, special materials available upon request
Fitting: 303 Stainless steel
Standard Thread: 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A		Table B	
	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSIG	INCREASING PSIG
3	3000	± 25.0	500	500
		± 50.0	1000	1000
		± 75.0	1500	1500
		± 100.0	2000	2000
		± 125.0	2500	2500
		± 150.0	2800	3000
4	5000	± 45.0	600	600
		± 60.0	1000	1000
		± 85.0	1500	1500
		± 100.0	2000	2000
		± 125.0	2500	2500
		± 150.0	3000	3000
		± 175.0	3500	3500
		± 200.0	4000	4000
5	6000	± 65.0	700	700
		± 75.0	1000	1000
		± 85.0	1500	1500
		± 100.0	2000	2000
		± 150.0	3000	3000
		± 200.0	4000	4000
		± 250.0	5000	5000
		± 300.0	5500	6000

*Exceeding sensor capacity may cause shift in set point
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

The Whitman Controls In-Stock “Distributor” Switches are built to meet any timeline, with same day shipping prior to 1pm EST. These Switches provide operating flexibility from vacuum to 6,000 PSIG, and are fitted with a pointer and range label affording the end user full field adjustability. Multiple set point ranges, amperages, electrical connectors, and fittings are available in each of our core product models.

Low Pressure Switches

Available Models: P88, P117, W117, and P119

Switch Options	P88
	Pressure Vacuum Compound
Set Point Range (PSIG/InHg)	1.5 – 500 / 1.0 – 28.2
Maximum System Pressure (PSIG)	500
Amperages	1 Amp
	5 Amps
	10 Amps
	15 Amps
	25 Amps
Electrical Connectors	Terminal Screws (TS) Terminal Blades (TB)
Available Fitting(s)	1/4” NPT Male



Switch Options	P117
	Pressure Vacuum
Set Point Range (PSIG/InHg)	0.80 – 500 / 1.0 – 28.2
Maximum System Pressure (PSIG)	500
Amperages	1 Amp
	5 Amps
Electrical Connectors	Terminal Screws (TS) Terminal Blades (TB) 12” Wire Leads (L)
Available Fitting(s)	1/8” NPT Male



Switch Options	W117
	Pressure Vacuum
Set Point Range (PSIG/InHg)	0.80 – 500 / 1.0 – 28.2
Maximum System Pressure (PSIG)	500
Amperages	1 Amp
	5 Amps
Electrical Connectors	Terminal Screws (TS) Terminal Blades (TB) 12” Wire Leads (L)
Available Fitting(s)	1/4” NPT Male 1/4” VCR Fitting



Switch Options	P119
	Pressure Vacuum
Set Point Range (PSIG/InHg)	0.80 – 500 / 1.0 – 28.2
Maximum System Pressure (PSIG)	500
Amperages	1 Amp
	5 Amps
Electrical Connectors	Terminal Screws (TS) Terminal Blades (TB) 12” Wire Leads (L)
Available Fitting(s)	1/8” NPT Male



Higher Pressure Switches

Available Models: J205, P605, and J705

	J205		P605	
	Pressure Vacuum		Pressure	
Switch Options				
Set Point Range (PSIG/InHg)	0.80 – 800 / 1.0 – 28.2		400 – 6,000	
Maximum System Pressure (PSIG)	5,000		6,000	
Amperages	1 Amp 5 Amps		1 Amp 5 Amps	
Electrical Connectors	Terminal Screws (TS) Terminal Blades (TB) 12" Wire Leads (L)		Terminal Screws (TS) Terminal Blades (TB) 12" Wire Leads (L)	
Available Fitting(s)	1/8" NPT Male 1/4" VCR Fitting		1/4" NPT Male	
	J705			
	Pressure			
Switch Options				
Set Point Range (PSIG/InHg)	500 – 6,000			
Maximum System Pressure (PSIG)	6,000			
Amperages	1 Amp 5 Amps			
Electrical Connectors	Terminal Screws (TS) Terminal Blades (TB) 12" Wire Leads (L)			
Available Fitting(s)	1/8" NPT Male			

VACUUM SWITCHES

We offer an extensive selection of vacuum switches affording the end-user maximum versatility in a wide range of operating environments. Our preset switches are set at the factory to the specifications and parameters to fit our customers' requirements. Our field adjustable switches allow our customers the flexibility of easily setting the switch parameters in the field as driven by the needs of the project.

	Vacuum Switch Selection Guide	23
	Part Number Construction	24
P88V	Economical Vacuum Switch.....	25
P100V	High Accuracy Low Vacuum Environment Vacuum Switch.....	26
P117V	Stainless Steel Miniature Vacuum Switch.....	27
P117LV	NEMA 4 Stainless Steel Vacuum Switch.....	28
W117V	Ultra Pure Stainless Steel Vacuum Switch.....	29
W117LV	NEMA 4 Ultra Pure Stainless Steel Vacuum Switch	30
P119V	Zinc Diecast Body Vacuum Switch	31
J205V	J205V High Pressure Vacuum Set Point Vacuum Switch	32
J205LV	J205LV NEMA 4 High Pressure Vacuum Set Point	33

Vacuum Switch Selection Guide

The chart below gives an overview of our vacuum switch product catalog at Whitman, and the functionality of each of our switches. Depending on your desired set point, and maximum system pressure, you will find a switch that will meet your specific needs and exceed your expectations.

SPECIFICATIONS

	P88V / P88C	P100V	P117V / P117LV	W117V / W117LV	P119V	J205V / J205LV
Minimum Set Point (InHg)	6.0	0.40	1.6	1.6	1.6	1.6
Maximum Set Point (InHg)	28.0	11	28.2	28.2	28.2	28.2
Maximum System Vacuum (InHg)	29.9	11	29.9	29.9	29.9	29.9
Maximum System Pressure (PSIG)	0	0	0	0	0	5,000

Steps Required for Identifying the Right Vacuum Switch for your Application:

- Step 1:** Identify the Maximum System Pressure on your Application
- Step 2:** Identify your Set Point and if on “Increasing” or “Decreasing” vacuum
- Step 3:** Select a Sensor Code that applies to the Maximum System Pressure and Set Point Range desired for your application – Reference Table A on the corresponding Switch Page
- Step 4:** Determine your Set Point Option: C-set (Customer set, field adjustable), K-set (Factory pre-set to customer specifications, field adjustable), F-set (Factory set, non-adjustable)
- Step 5:** Select your Electrical Amperage and Contact Selection – Reference Electrical Switch Tables
- Step 6:** Select your Electrical Interface – Reference Electrical Interface Options
- Step 7:** Select your Wire Length if longer than 12” (Standard) is desired
- Step 8:** Confirm Wetted Materials are compatible with Fluid and Environment
- Step 9:** Select Additional Options – Reference Additional Options or Consult Factory

Please refer to our website at www.whitmancontrols.com for additional information or contact our engineering department at engineering@whitmancontrols.com.

Limitation of Application Liability:

Whitman Controls Corporation assumes the buyer to be expert in the intended application of Whitman Controls’ products. Whitman Controls claims no special expertise in the application of its products in the buyer’s equipment. Whitman Controls accepts no responsibility for the buyer’s selection and use of Whitman Controls products. Buyer’s interpretation and implementation of application suggestions and recommendations by Whitman Controls, general or specific, transmitted verbally or in writing, published or unpublished, is strictly at the buyer’s own risk.

Terms and Conditions:

All sales FOB Bristol, CT prepaid and added to the invoice. All prices net. Prices and specifications are subject to change without notice. Terms with established credit are net 30 days. Returns will not be accepted without a return authorization number issued by Whitman Controls. A 30% restocking fee will be charged on all items returned unless merchandise shipped was due to a Whitman Controls error.

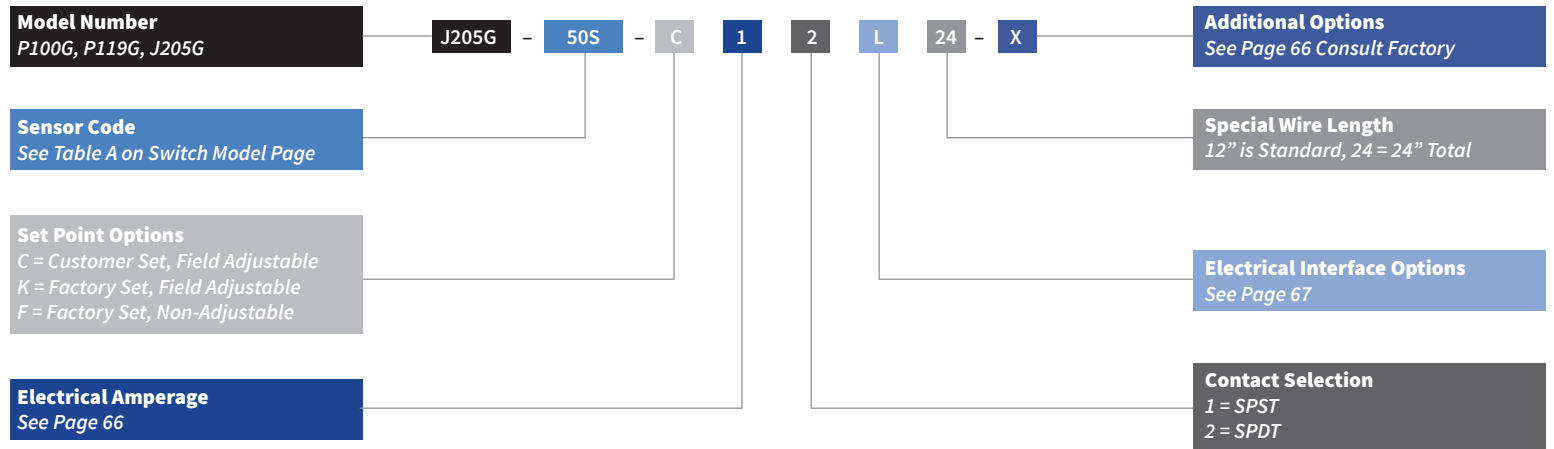
International Terms and Conditions:

All sales FOB Bristol, CT. Payment prepaid in U.S. Dollars, on a U.S. Bank or by electronic transfer to a Whitman Controls banking institution.

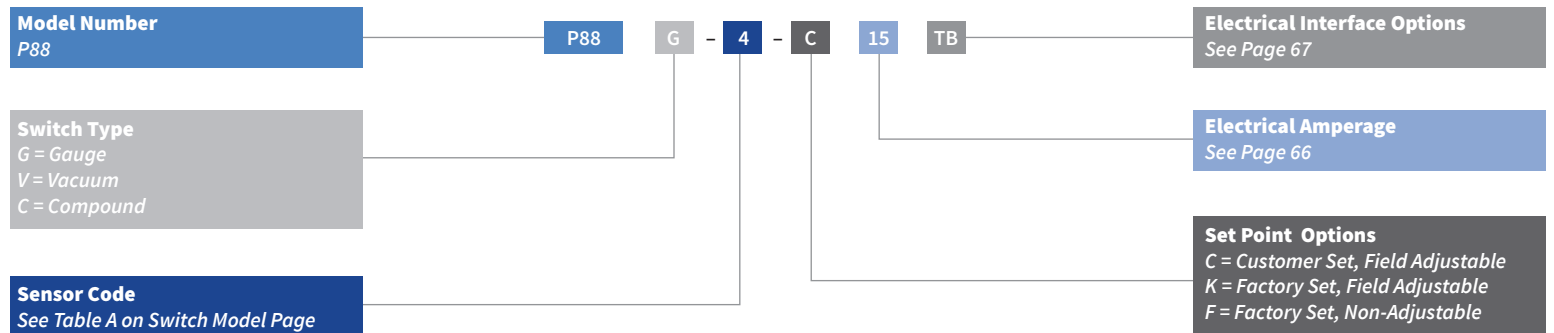
Three Year Limited Warranty

The proven quality and reliability of Whitman Controls Corporation Pressure, Vacuum, Liquid Level, and Temperature Switches are backed by our 3 Year Limited Warranty when used in normal operation. Our complete warranty statement is provided with all quotations or is available on request.

All Pressure, Vacuum and Compound Switch Models Except P88, P90, P95



P88 Pressure, Vacuum, Compound Switches



P88V

Economical Vacuum Switch

OVERVIEW

The Whitman Controls P88V Economical Vacuum switches are typically used in applications where reliable switch control supersedes accuracy of set point. These switches can be used in dry indoor applications or placed within an enclosure. Controlling on and off functions for fans and pumps where one may need a wide differential to prevent over-cycling is an ideal application use for the P88V.



KEY FEATURES

- Consistent switch control
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range

SPECIFICATIONS

- **Set point Range:** 6.0 to 28.0 inHg
- **Max System Vacuum:** 29.9 InHg
- **Temperature Range:** -31°F to +185°F (-35°C to +85°C)
- **Amps:** 1 - 15 Amps
- **Sensor Element:** Diaphragm
- **Weight:** 7.4 oz
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: Buna N and Brass
 Seal: Loctite #271
 Body with Fitting: Zinc alloy, chromate finish
 Standard Thread: 1/4-18 NPT Male
 Optional Thread: 1/4-18 BSPT male, 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B
SENSOR CODE	MAXIMUM SYSTEM VACUUM / PRESSURE	SET POINT REPEATABILITY	SET POINT RANGE
	Inches Hg / PSIG	Inches Hg	Inches Hg
1	29.9 / 600	± 1.2	6.0 - 28.0

*Exceeding sensor capacity may cause shift in set point

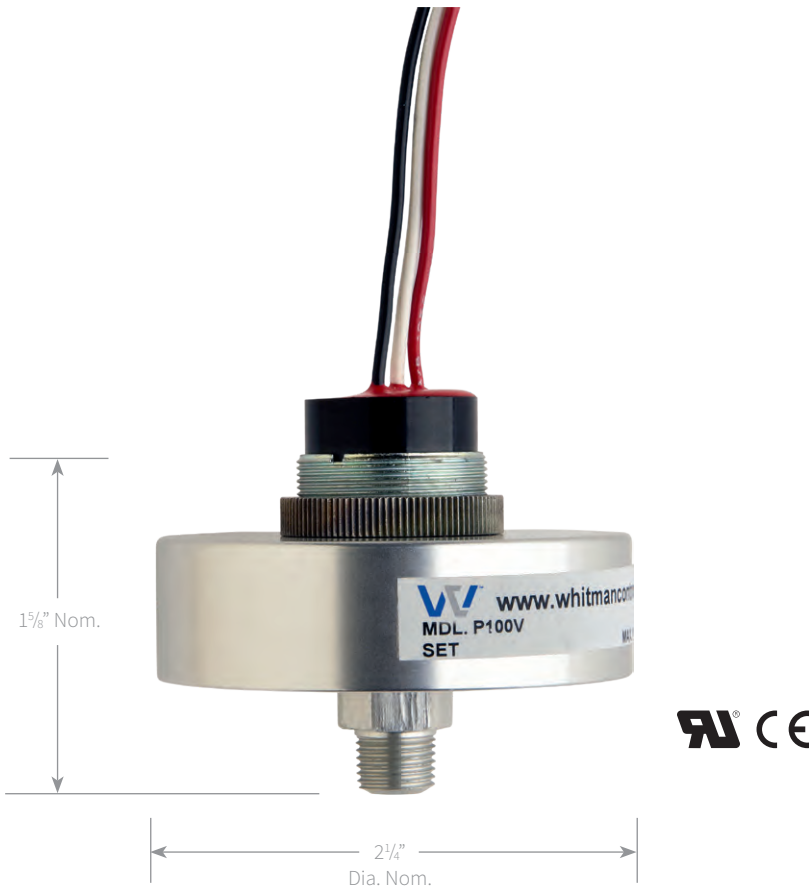
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P100V

High Accuracy Low Vacuum Environment Vacuum Switch

OVERVIEW

The Whitman Controls P100V High Accuracy Low Vacuum Environment Vacuum switches are ideal in low vacuum applications where precision of setpoint must be high and repeatability low. These switches are commonly used in natural gas well heads, natural gas generator sets, and air applications like forced draft blowers. The P100V can be used both in dry indoor applications or within an enclosure.



KEY FEATURES

- Highly accurate setpoints and repeatability
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 5.4 to 150 In. H₂O (0.4 to 11.0 InHg)
- **Max System Vacuum:** 149.5 In. H₂O, 11.0 InHg
- **Temperature Range:** -65°F to +190°F (-54°C to +88°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.8 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: Buna N with 316 stainless steel reinforcing
 Seal: Loctite #271
 Body: Anodized aluminum
 Standard Thread: 1/8-27 NPT male, other fittings available in quantities

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A								
SENSOR CODE	MAXIMUM SYSTEM VACUUM		SET POINT REPEATABILITY		SET POINT RANGE			
	Inches Hg	Inches H ₂ O	Inches Hg	Inches H ₂ O	DECREASING		INCREASING	
					Inches Hg	Inches H ₂ O	Inches Hg	Inches H ₂ O
1	11.0	-	± 0.06	-	0.4 - 9.9	-	0.5 - 11.0	-
1	-	149.5	-	± 0.8	5.4 - 134.53	-	6.8 - 149.5	-

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P117V

Stainless Steel Miniature Vacuum Switch

OVERVIEW

The Whitman Controls P117V Stainless Steel Miniature Vacuum switches are sharp, highly versatile devices that can be used in hundreds of OEM and routine mechanical applications. There are numerous fitting and electrical connection options available.

KEY FEATURES

- Miniature size
- Stainless steel body
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Max System Pressure:** 0 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule
- **Weight:** 3.0 oz (varies with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH
 Seal: Loctite #271
 Fitting: 303 Stainless steel
 Standard Thread: 1/8-27 NPT male
 Optional Threads: 1/4-18 NPT male, 7/16-20 UNF male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM VACUUM*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	Inches Hg	DECREASING INCHES Hg	INCREASING INCHES Hg
3H	29.9	± 1.2	1.6 - 27.0	2.7 - 28.2
5H	29.9	± 2.0	4.0 - 24.8	5.1 - 28.2
10H	29.9	± 4.0	6.0 - 21.5	8.4 - 28.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P117LV

NEMA 4 Stainless Steel Vacuum Switch

OVERVIEW

The Whitman Controls P117LV NEMA 4 Stainless Steel Vacuum Switches are the weather-proof, liquid-resistant version of the P117V. The NEMA 4 rating makes these rugged switches suitable for outside applications or in areas of condensing humidity. Unlike the P117V, the P117LV set point is factory set to customer specification and is non-adjustable. Numerous fitting options are available.

KEY FEATURES

- Miniature size
- Stainless steel body
- NEMA 4 Rated
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Max System Pressure:** 0 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule
- **Weight:** 3.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH
 Fitting: 303 Stainless steel
 Standard Thread: 1/8 -27 NPT male
 Optional Threads: 1/4 -18 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM VACUUM*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	Inches Hg	DECREASING INCHES Hg	INCREASING INCHES Hg
3H	29.9	± 1.2	1.6 - 27.0	2.7 - 28.2
5H	29.9	± 2.0	4.0 - 24.8	5.1 - 28.2
10H	29.9	± 4.0	6.0 - 21.5	8.4 - 28.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

W117V

Ultra Pure Stainless Steel Vacuum Switch

OVERVIEW

The Whitman Controls W117V Ultra Pure Stainless Steel Vacuum Switches have all welded stainless steel interiors which are Helium leak checked to pass 4×10^{-9} Std CC/Sec. These switches are used in silicon wafer ovens, numerous medical devices, and other applications where even the slightest impurities are not tolerated. There are a number of fitting options available featuring the 1/4" VCR Male and many interface options to fit any application.

KEY FEATURES

- High purity
- Welded stainless steel body and interiors, helium leak checked
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Max System Pressure:** 0 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Electric beam welded, helium leak tested (4×10^{-9} Std cc/sec)
- **Weight:** 3.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH, electron beam welded
 Fitting: 303 Stainless steel
 Standard Thread: 1/8-27 NPT male
 Optional Threads: 1/4 VCR male, 1/4-18 NPT male



(Shown with TB Interface)

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM VACUUM*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	Inches Hg	DECREASING INCHES Hg	INCREASING INCHES Hg
3H	29.9	± 1.2	1.6 - 27.0	2.7 - 28.2
5H	29.9	± 2.0	4.0 - 24.8	5.1 - 28.2
10H	29.9	± 4.0	6.0 - 21.5	8.4 - 28.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

W117LV

NEMA 4 Ultra Pure Stainless Steel Vacuum Switch

OVERVIEW

The Whitman Controls W117LV NEMA 4 Rated Ultra Pure Stainless Steel Vacuum Switches have all welded stainless steel interiors which are Helium leak checked to pass 4×10^{-9} Std cc/sec. These are the weather-proof, liquid-resistant version of the W117V suitable for outside applications or in areas of condensing humidity. These switches are used in Silicon Wafer Ovens, Medical Applications and where any impurities are not tolerated. There are numerous fitting options available featuring the 1/4" VCR Male. Unlike the W117V, the W117 LV set point is factory set to customer specification and is non-adjustable.

KEY FEATURES

- NEMA 4 Rated
- High purity
- Stainless steel body and interior, helium leak checked
- Weather-proof and liquid-resistant
- Set point options: Factory set to customer specification, non-adjustable
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Max System Pressure:** 0 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Electric beam welded, helium leak tested (4×10^{-9} Std cc/sec)
- **Weight:** 3.0 oz (varies slightly with electrical interface selection)
- **Wetted Parts:**
 Capsule: 17-7 PH, electron beam welded
 Fitting: 303 Stainless steel
 Standard Thread: 1/8"-27 NPT male
 Optional Threads: 1/4" VCR male, 1/4"-18 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM VACUUM*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	Inches Hg	DECREASING INCHES Hg	INCREASING INCHES Hg
3H	29.9	± 1.2	1.6 - 27.0	2.7 - 28.2
5H	29.9	± 2.0	4.0 - 24.8	5.1 - 28.2
10H	29.9	± 4.0	6.0 - 21.5	8.4 - 28.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P119V

Zinc Diecast Body Vacuum Switch

OVERVIEW

The Whitman Controls P119V Zinc Diecast Body Vacuum Switches are the inexpensive version of the P117V and recommended for indoor OEM use. It is commonly used in the medical field and as a safety switch in numerous applications. The compact nature of these switches make them ideal for tight spaces. They are available with a cast in 1/4" NPT fitting as an option. There are also several electrical interface options available.

KEY FEATURES

- Zinc Diecast Body
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Max System Pressure:** 0 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Capsule
- **Weight:** 2.0 oz (varies slightly with electrical interface selection)
- **Cycling:** 3H/5H – Not to exceed 60 CPM, 10H – Not to exceed 20 CPM
- **Wetted Parts:**
 Capsule: 17-7 PH
 Seal: Loctite #271
 Body with Fitting: Round body – Zamac 3, chromate finish
 Hex body – ZA8, chromate finish
 Standard Thread: 1/8-27 NPT male
 Optional Threads: 1/4-18 NPT male (Hex body only)



(Shown with TB Interface)

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B	
SENSOR CODE	MAXIMUM SYSTEM VACUUM*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	Inches Hg	DECREASING INCHES Hg	INCREASING INCHES Hg
3H	29.9	± 1.2	1.6 - 27.0	2.7 - 28.2
5H	29.9	± 2.0	4.0 - 24.8	5.1 - 28.2
10H	29.9	± 4.0	6.0 - 21.5	8.4 - 28.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

J205V

J205V High Pressure Vacuum Set Point Vacuum Switch

OVERVIEW

The Whitman Controls J205V High Pressure Vacuum Set Point Vacuum Switches are among our most versatile offering, affording the end user an extensive operating environment and a wide range of set point optionality. These switches can be exposed to 5,000 psig without compromising integrity or vacuum set point. Uses include gas bottle change switches and oil or water supply control. They are frequently used in pump and reservoir applications. The internals are stainless steel with a diaphragm O-ring that is available in numerous compounds.

KEY FEATURES

- Vacuum set points with overpressure feature, allowing the switch to be subject to high pressure without compromising integrity
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability
- Wide range of set point optionality

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Proof Pressure:** 5,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 4.0 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: 316 Stainless steel
 Seal: Loctite #271
 Body / Fitting: 303 Stainless steel
 O-Ring: Buna N Standard (Special material available upon request)
 Standard Thread: 1/8-27 NPT male
 Optional Threads: 1/4 VCR male, 1/4-18 NPT male, 7/16-20 UNF male



(Shown with Military M Interface)

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A			Table B	
	MAXIMUM SET POINT	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	PSIG	Inches Hg	DECREASING Inches Hg	INCREASING Inches Hg
1S	29.9	5000	± 1.6	1.6 - 22.5	2.2 - 28.2
10S	29.9	5000	± 8.0	8.0 - 21.8	8.0 - 28.2

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

J205LV

J205LV NEMA 4 High Pressure Vacuum Set Point Vacuum Switch

OVERVIEW

The Whitman Controls J205LV NEMA 4 High Pressure Vacuum Set Point Vacuum Switches are among our most versatile offering, affording the end user an extensive operating environment and a wide range of set point optionality. These switches can be exposed to 5,000 psig without compromising integrity or vacuum set point. The J205LV is the NEMA 4 rated weather-proof, liquid-resistant version of the J205G, suitable for outside applications or in areas of condensing humidity. Uses include gas bottle change switches and oil or water supply control. They are frequently used in pump and reservoir applications. The internals are stainless steel with a diaphragm O-ring that is available in numerous compounds.

KEY FEATURES

- NEMA 4 Rated
- Vacuum set points with overpressure feature, allowing the switch to be subject to high pressure without compromising integrity
- Weather-proof and liquid-resistant
- Set point options: Factory set to customer specification, non-adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability
- Wide range of set point optionality

SPECIFICATIONS

- **Set Point Range:** 1.6 to 28.2 InHg
- **Proof Pressure:** 5,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 4.0 oz (approx.)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 Diaphragm: 316 Stainless steel
 Seal: Loctite #271
 Body / Fitting: 303 Stainless steel
 O-Ring: Buna N Standard, special materials available upon request
 Standard Thread: 1/8-27 NPT male



SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A			Table B	
	MAXIMUM SET POINT	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	Inches Hg	PSIG	Inches Hg	DECREASING Inches Hg	INCREASING Inches Hg
1S	29.9	5000	± 1.6	1.6 - 22.5	2.2 - 28.2
10S	29.9	5000	± 8.0	8.0 - 21.8	8.0 - 28.2

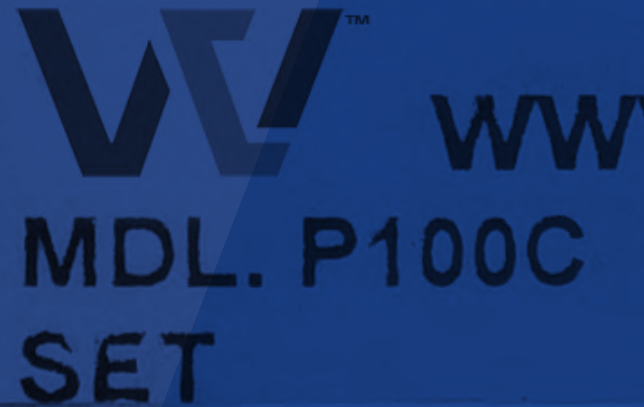
*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

COMPOUND SWITCHES

Our selection of compound switches are suitable for applications where the end-user is looking for highly accurate switch control across positive or negative pressure environments. Our preset switches are set at the factory to the specifications and parameters to fit our customers' requirements. Our field adjustable switches allow our customers the flexibility of easily setting the switch parameters in the field as driven by the needs of the project.

P88C	Economical Compound Switch	35
P100C	High Accuracy Compound Switch	36

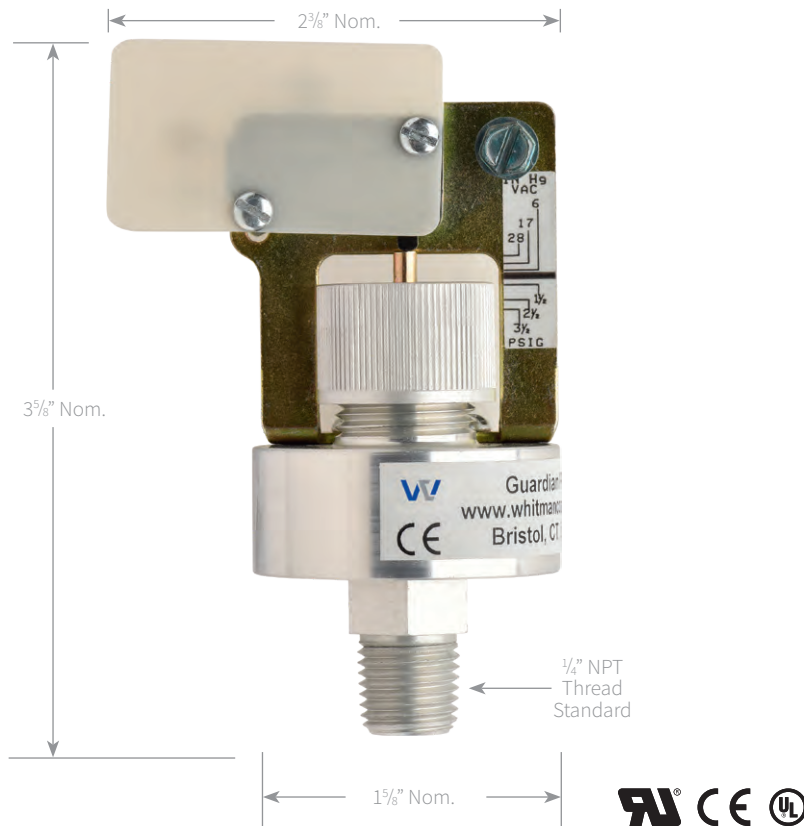


P88C

Economical Compound Switch

OVERVIEW

The Whitman Controls P88C Economical Compound switches are typically used in applications where reliable switch control supersedes accuracy of set point. These switches can be used in dry indoor applications or placed within an enclosure. Controlling on and off functions for fans and pumps where one may need a wide differential to prevent over-cycling is an ideal application use for the P88.



KEY FEATURES

- Consistent switch control
- Versatile with the ability to operate in positive and negative pressure ranges
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range

SPECIFICATIONS

- **Set Point Range:** 1 to 500 PSIG Gage and 6 to 28 In Hg Vacuum
- **Max System Pressure:** 600 PSIG
- **Temperature Range:** -31°F to +185°F (-35°C to +85°C)
- **Amps:** 1-15 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.0 oz
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
Limp Diaphragm: Buna N and Brass
Seal: Loctite #271
Body with Fitting: Zinc alloy, chromate finish
Optional Thread: 1/4-18 BSPT male, 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

Table A			Table B
SENSOR CODE	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE
	Inches Hg / PSIG	Inches Hg / PSIG	Inches Hg / PSIG
2	29.9 / 600	± 1.2 / ± 0.15	28.0 InHg to 3.5 PSIG

*Exceeding sensor capacity may cause shift in set point

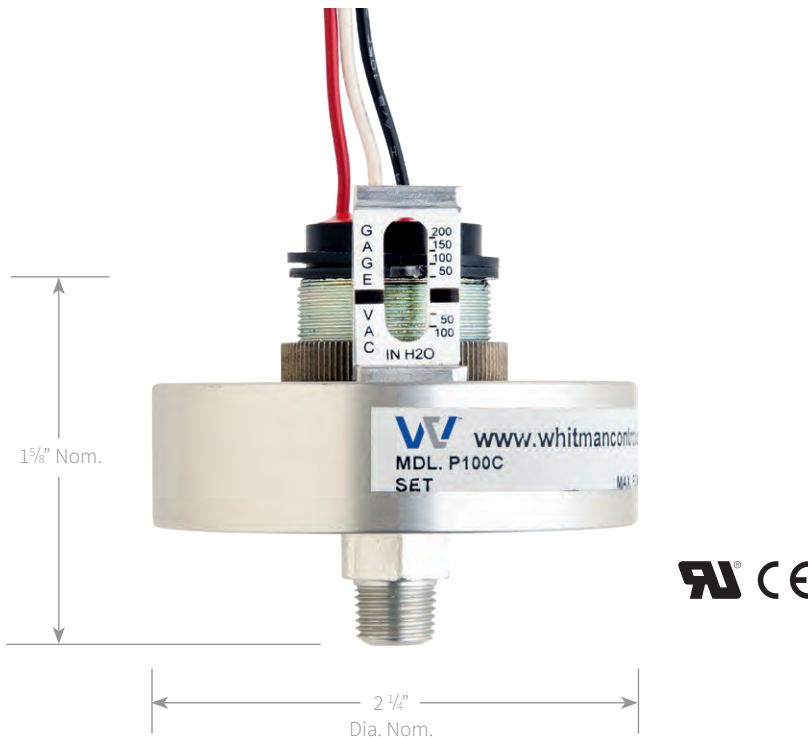
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

P100C

High Accuracy Compound Switch

OVERVIEW

The Whitman Controls P100C High Accuracy Compound Switches are ideal in applications where precision of setpoint must be high and repeatability low. These switches are commonly used in natural gas well heads, natural gas generator sets, and air applications like forced draft blowers. The P100C can be used both in dry indoor applications or within an enclosure.



KEY FEATURES

- Highly accurate setpoints and repeatability
- Versatile with the ability to operate in positive and negative pressure ranges
- Set point options: Factory set, field adjustable, or a combination
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set Point Range:** Vacuum to 6,000 PSIG Gage
- **Max System Pressure:** 15 PSIG
- **Temperature Range:** -65°F to +190°F (-54°C to +88°C)
- **Amps:** 5 Amps Max
- **Sensor Element:** Diaphragm
- **Weight:** 7.8 oz (varies slightly with electrical interface selection)
- **Cycling:** Not to exceed 20 CPM
- **Wetted Parts:**
 Diaphragm: Buna N with 316 stainless steel reinforcing
 Sealing Compound: Loctite #271
 Body: Anodized aluminum
 Standard Thread: 1/8-27 NPT male

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A						Table B						
	MAXIMUM SYSTEM PRESSURE*			SET POINT REPEATABILITY			SET POINT RANGE						
	PSIG	Inches Hg	Inches H ₂ O	PSIG	Inches Hg	Inches H ₂ O	DECREASING			INCREASING			
1	15.0	-	-	±0.03	-	-	0.10 - 14.27	-	-	-	0.15 - 15.0	-	-
1	-	30.54	-	-	±0.06	-	-	0.21 - 29.06	-	-	-	0.31 - 30.54	-
1	-	-	415.2	-	-	±0.8	-	-	2.75 - 395.03	-	-	-	4.15 - 415.2
SENSOR CODE	MAXIMUM SYSTEM VACUUM		SET POINT REPEATABILITY		SET POINT RANGE								
	Inches Hg	Inches H ₂ O	Inches Hg	Inches H ₂ O	DECREASING		INCREASING						
	Inches Hg	Inches H ₂ O	Inches Hg	Inches H ₂ O	Inches Hg	Inches H ₂ O	Inches Hg	Inches H ₂ O					
1	11.0	-	±0.06	-	0.4 - 9.9	-	0.5 - 11.0	-	-				
1	-	149.5	-	±0.8	5.4 - 134.53	-	6.8 - 149.5	-	-				

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

DIFFERENTIAL PRESSURE SWITCHES

Our P845 Differential Pressure Switch can operate across a wide variety of media while providing differential setpoints to 250 PSID and withstanding maximum differential pressure up to 2,000 PSID.

P845 Differential Pressure Switch..... **38**



www.whitmancontrols.com
L. P845-5-KR2L
1100PSID INCR
S/I/O 123456
ELECT
MAX PSIG 6000
DATE 6/17

P845

Differential Pressure Switch

OVERVIEW

The Whitman Controls P845 Differential Pressure Switches are rugged and versatile, with excellent by-pass characteristics and the ability to handle a wide variety of media to 6,000 PSIG and set point ranges to 250 PSID. These switches are NEMA 4 rated and can tolerate submersion. They are commonly used across oil and water filter heads to detect when a filter element needs changing. It may be mounted in any orientation and is capable of carrying light to moderate mechanical shock and vibratory loads.



KEY FEATURES

- Rugged and versatile with the ability to handle a wide variety of media
- Resistant to moderate mechanical shock and vibratory loads
- Set point options: Customer or Factory set, both field adjustable
- Extensive operating temperature range
- Wide range of electrical interfaces available
- SPDT or SPST availability

SPECIFICATIONS

- **Set point range:** 2 - 250 PSID
- **Max Differential Pressure:** 2,000 PSID
- **Max System Pressure:** 6,000 PSIG
- **Proof Pressure:** 9,000 PSIG
- **Temperature Range:** -65°F to +225°F (-54°C to +107°C)
- **Amps:** ¼ Amps Max
- **Sensor Element:** Piston
- **Weight:** 8.5 oz (approx.)
- **Cycling:** Not to exceed 100 CPM
- **Wetted Parts:**
 - Spring: Steel
 - Body & Piston: Anodized aluminum
 - Seal: Buna
 - Sealing Compound: Loctite \$271
 - Fitting: Anodized aluminum, ¼-18 NPT Female

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

SENSOR CODE	Table A		Table B	
	MAXIMUM SYSTEM PRESSURE*	SET POINT REPEATABILITY	SET POINT RANGE	
	PSIG	PSIG	DECREASING PSID	INCREASING PSID
1	6000	± 2.0	2.0 - 7.0	7.0 - 13.0
2	6000	± 4.0	5.0 - 16.0	13.0 - 25.0
3	6000	± 8.0	10.0 - 21.0	25.0 - 45.0
4	6000	± 16.0	20.0 - 80.0	35.0 - 160.0
5	6000	± 32.0	35.0 - 120.0	120.0 - 250.0

*Exceeding sensor capacity may cause shift in set point

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

LIQUID LEVEL SWITCHES

Our Liquid Level switches come in a number of sizes and materials for use in a variety of industrial applications and other end-user solutions. Every switch is sealed with our patented “Red Seal” potting, affording submersibility to a NEMA 6 rating.

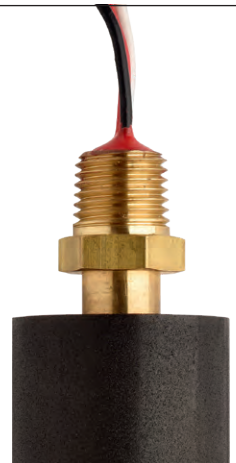
	Liquid Level Information.....	40
	Liquid Level Switch Selection Guide.....	41
L10	Vertical Brass Buna Temperature-Level Switch	42
L20/L25	Side Mounted Stainless Steel Liquid Level Switch	43
L20/L25	Side Mounted CPVC Plastic Liquid Level Switch	44
L20/L25	Side Mounted Kynar Plastic Liquid Level Switch.....	45
L20/L25	Side Mounted Polypropylene Liquid Level Switch.....	46
L30	Vertical Multi-Station Stainless Steel Liquid Level Switch.....	47
L30	Vertical Multi-Station Brass Buna Liquid Level Switch.....	48
L31	Heavy Duty Vertical Multi-Station Stainless Steel Liquid Level Switch.....	49
L40	Vertical Mount 1” Cylinder Stainless Steel Liquid Level Switch ..	50
L40	Vertical Mount 1” Sphere Stainless Steel Liquid Level Switch.....	51
L40	Vertical Mount Brass / Buna Liquid Level Switch.....	52
L40	Vertical Mount CPVC Plastic Liquid Level Switch.....	53
L40	Vertical Mount Kynar Plastic Liquid Level Switch.....	54
L40	Vertical Mount Polypropylene Liquid Level Switch.....	55
L54/L55	Bent Stem Side Mount Stainless Steel Liquid Level Switch	56
L60	Heavy Duty Vertical Mount 2” Sphere Stainless Steel Liquid Level Switch.....	57
L60	Heavy Duty Vertical Mount Brass / Buna Liquid Level Switch	58
L70	Mini Polypropylene Vertical Mount Liquid Level Switch.....	59

Liquid Level Information



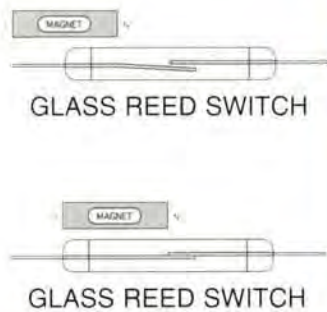
The Whitman Controls full line of quality liquid level switches are factory sealed with our **Red Seal** potting compound, allowing submersibility to a NEMA 6 rating. Every switch meets our high quality standards and rigorous internal testing requirements, providing the end user confidence in the performance of our offering. Our ISO 9001 Certified Quality Management System combined with extensive experience in related products, means greater assurance that Whitman Liquid Level Switches will deliver accuracy and reliability year after year. The National

Sanitation Foundation (N.S.F.) has approved our line of liquid level switches for use in food, food handling, potable water, beverage dispensing, and sanitary system components and equipment.

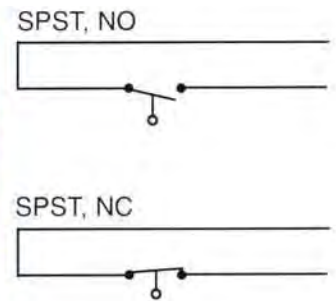


Dry Reed Switch Information

The dry reed switch in our liquid level switches is a single pole single throw (SPST) device that may run either normally open (NO) or normally closed (NC) by reversing the float or the mounting of the switch.



Electrical Ratings – Max Resistive Load AC and DC Except As Noted:			
CONTACT RATING	VOLTS	AMPS AC	AMPS DC
50 VA	0-25	1.5	1.5
	50	0.5	0.5
	120	0.4	0.4
	150 VAC RMS	0.25	
	200 VDC		0.25



Installation Instructions:

While our Red Seal liquid level switches are rugged, care should be given to the tightening of the switches during installation. Here are some simple reminders that will make this process easy and damage free:

Note: Over tightening will damage the threads and cause a leak. Threads damaged by over tightening will not be covered by our Warranty.

1. During installation, use care in tightening the connection.
2. Using an appropriate wrench, turn the switch to approximately $\frac{1}{2}$ to $\frac{3}{4}$ turn past “hand tight.”
3. This connection can be subjected to a pressure equal to the crush pressure of the float.

Three Year Limited Warranty

The proven quality and reliability of Whitman Controls Corporation Pressure, Vacuum, Liquid Level, and Temperature Switches are backed by our 3 Year Limited Warranty when used in normal operation. Our complete warranty statement is provided with all quotations or is available on request.

Liquid Level Switch Selection Guide

The chart below gives an overview of our liquid level switch product catalog at Whitman, and the functionality of each of our levels. Depending on your minimum liquid specific gravity, wetted materials, temperature range, and maximum system pressure, you will find a switch that will meet your specific needs and exceed your expectations.

SPECIFICATIONS

Liquid Switch Model Number	Min. Liquid Specific Gravity	Wetted Materials	Liquid Temperature Range	Max. System Pressure (PSIG)
L10 Temp-Level	0.75	Brass, Buna, 316 S.S.	-40°F to +180°F (+230°F in oil)	160
L20 / L25 Side Mounted S.S.	0.85	316 Stainless Steel	-40°F to +257°F	500
L20 / L25 Side Mounted CPVC Plastic	0.90	CPVC Plastic	-40°F to +180°F	100
L20 / L25 Side Mounted Kynar Plastic	1.00	Kynar Plastic	-40°F to +180°F	100
L20 / L25 Side Mounted Polypropylene	0.70	Polypropylene	-40°F to +180°F	100
L30 S.S. Multi-Level	0.85	316L Stainless Steel	-40°F to +300°F	1,000
L30 Brass / Buna Multi-Level	0.70	Brass stem, Buna float	-40°F to +180°F (+230°F in oil)	160
L31 S.S. Heavy Duty Multi-Level	0.85	316L Stainless Steel	-40°F to +300°F	975
L40 Vertical Mount 1" Cylinder S.S.	0.90	316L Stainless Steel	-40°F to +300°F	900
L40 Vertical Mount 1" Sphere S.S.	0.85	316L Stainless Steel	-40°F to +300°F	1,000
L40 Vertical Mount Brass / Buna	0.70	Brass stem, Buna float, 316 S.S.	-40°F to +300°F (230°F in oil)	160
L40 Vertical Mount CPVC Plastic	0.85	CPVC Plastic	-40°F to +180°F	100
L40 Vertical Mount Kynar Plastic	1.00	Kynar Plastic	-40°F to +180°F	100
L40 Vertical Mount Polypropylene	0.70	Polypropylene	-40°F to +180°F	100
L54 / L55 Bent Stem Side Mount S.S.	0.90	316L Stainless Steel	-40°F to +300°F	900
L60 Vertical Mount 2" Sphere S.S.	0.80	316L Stainless Steel	-40°F to +300°F	975
L60 Vertical Mount Brass / Buna	0.75	Brass stem, Buna float, 316 S.S.	-40°F to +180°F (+230°F in oil)	160
L70 Mini Polypropylene Vertical Mount	0.77	Polypropylene, Buna	-40°F to +176°F	100

Steps Required for Identifying the Right Liquid Level Switch for your Application:

Step 1: Determine your Liquid Specific Gravity – Ratio of Mass of liquid to mass of equal volume of water

Step 2: Select a float material that is compatible with your Liquid

Step 3: Identify your Maximum System Pressure

Step 4: Select an Optimal Mounting Orientation – Horizontal/Side Mounted, Vertical / Top Mounted, Multi-Level

Step 6: Determine your ideal Fitting

Step 7: Select any Additional Options

Please refer to our website at www.whitmancontrols.com for additional information or contact our engineering department at engineering@whitmancontrols.com.

Limitation of Application Liability:

Whitman Controls Corporation assumes the buyer to be expert in the intended application of Whitman Controls' products. Whitman Controls claims no special expertise in the application of its products in the buyer's equipment. Whitman Controls accepts no responsibility for the buyer's selection and use of Whitman Controls products. Buyer's interpretation and implementation of application suggestions and recommendations by Whitman Controls, general or specific, transmitted verbally or in writing, published or unpublished, is strictly at the buyer's own risk.

Terms and Conditions:

All sales FOB Bristol, CT prepaid and added to the invoice. All prices net. Prices and specifications are subject to change without notice. Terms with established credit are net 30 days. Returns will not be accepted without a return authorization number issued by Whitman Controls. A 30% restocking fee will be charged on all items returned unless merchandise shipped was due to a Whitman Controls error.

International Terms and Conditions:

All sales FOB Bristol, CT. Payment prepaid in U.S. Dollars, on a U.S. Bank or by electronic transfer to a Whitman Controls banking institution.

L10

Vertical Brass Buna Temperature-Level Switch

OVERVIEW

The Whitman Controls L10 Series Vertical Mount Brass Buna Temperature-Level Switches are highly versatile, providing the end-user the ability to control both temperature and liquid level within an application. These switches can be used to set off high/low temperature alarms along with a number of other functions. The buna float can be used in numerous liquids and can survive up to 230°F in oil. The internal thermostats are available from 100°F to 225°F in 25°F increments, with special temperatures available for O.E.M. customers. There are numerous wiring combinations and other options available to afford the end-user extreme functionality.

KEY FEATURES

- Highly versatile with temperature and liquid level control
- Whitman Red Seal potting submersible to a NEMA 6 rating
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Minimum Liquid Specific Gravity:** 0.75
- **Liquid Temperature range:** -40°F to +180°F (-40°F to +230°F in oil)
- **Temperature Settings:** +100°F to +225°F in 25°F increments
- **Repeatability:** +/- 5°F
- **Max System Pressure:** 160 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)
- **Wetted Materials:** Brass stem, buna float

PERFORMANCE CHARACTERISTICS

	L10 Series
Fitting	1/4" NPT, 5/8" Hex
Wetted Materials	Brass, Buna, 316 SS
Electrical Ratings:	
Level Switch:	50 Volt Amps, 1/4 A at 150 VAC
Temp Switch:	8 Amps at 12 VDC, 2.6 Amps at 120 VAC
Temperature Range	-40°F to +180°F
Minimum Liquid Specific Gravity	0.75
Crush Pressure	160 PSIG
Lead Wires	20 AWG 24" PVC

*Response time is approximately 1°F/second and may vary by media and conditions

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



PART NUMBER CONSTRUCTION:

LXX - 06 - C3 - 15 - NX - XX

O = Level N/O B = Temp N/O
C = Level N/C C = Temp N/C

- | | |
|-------------------------------|-------------|
| 11 = 4 Wire Temp N/O | 2 = 100° F |
| 12 = 4 Wire Temp N/C | 3 = 125° F |
| 13 = 3 Wire Temp N/O | 4 = 150° F |
| 14 = 3 Wire Temp N/C | 5 = 175° F |
| 15 = 2 Wire Temp N/O Series | 6 = 200° F |
| 16 = 2 Wire Temp N/C Series | 7 = 225° F |
| 17 = 2 Wire Temp N/O Parallel | 8 = SPECIAL |
| 18 = 2 Wire Temp N/C Parallel | |

L20/L25

Side Mounted Stainless Steel Liquid Level Switch

OVERVIEW

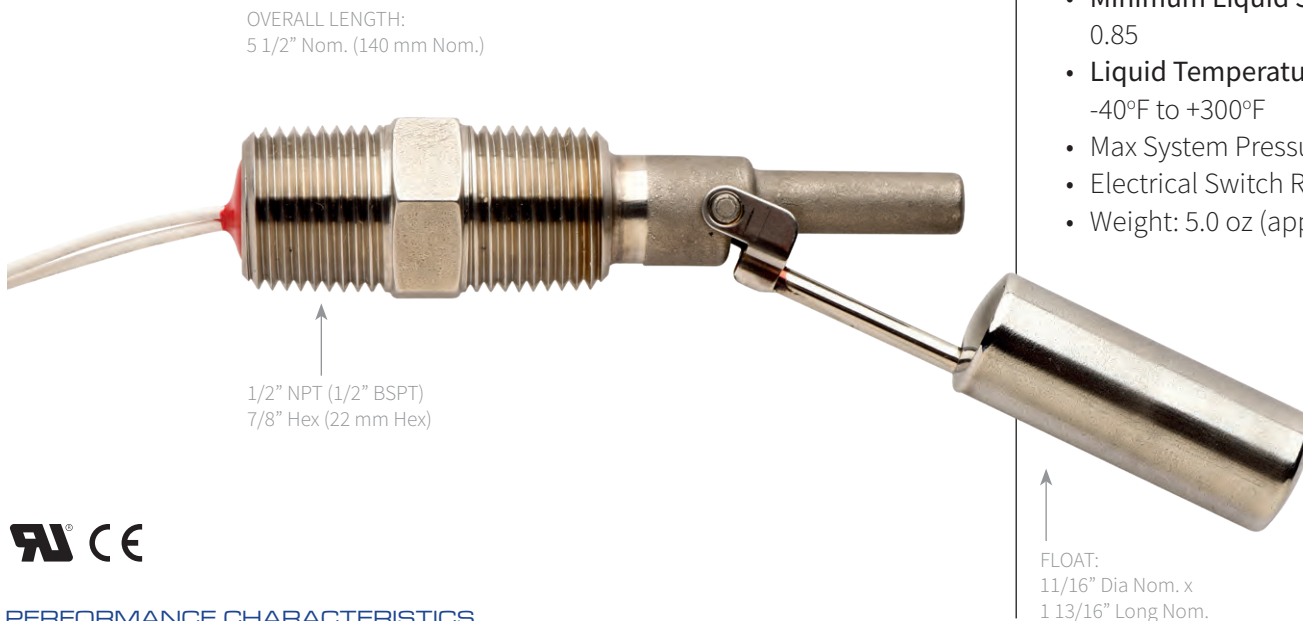
The Whitman Controls L20/L25 Series Side Mounted 316L Stainless Steel Liquid Level Switches are commonly used in potable water, hot water, various acids, and in solvents. The side mount provides added versatility, allowing the switch to be used as a high or low level indicator, and stainless steel body provides use up to 500 PSI. These are most often used in many O.E.M. and various other custom industrial applications. These are available with several options as specified by the user.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- 316 / 316L Stainless steel stem and float
- Side mounted
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** 316 / 316L Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.85
- **Liquid Temperature range:** -40°F to +300°F
- Max System Pressure: 500 PSIG
- Electrical Switch Rating: 50 VA
- Weight: 5.0 oz (approx.)



PERFORMANCE CHARACTERISTICS

	L20 Series	L25 Series
Fitting	1/2" NPT	1/2" BSPT
Wetted Materials	316 SS	316 SS
Electrical Switch Rating	50 VA	50 VA
Temperature Range	-40°F to +257°F	-40°C to +125°C
Minimum Liquid Specific Gravity	0.85	0.85
Crush Pressure	500 PSI	35 BAR
Part Number	L20-02-S2-02-NO	L25-02-S2-02-NO

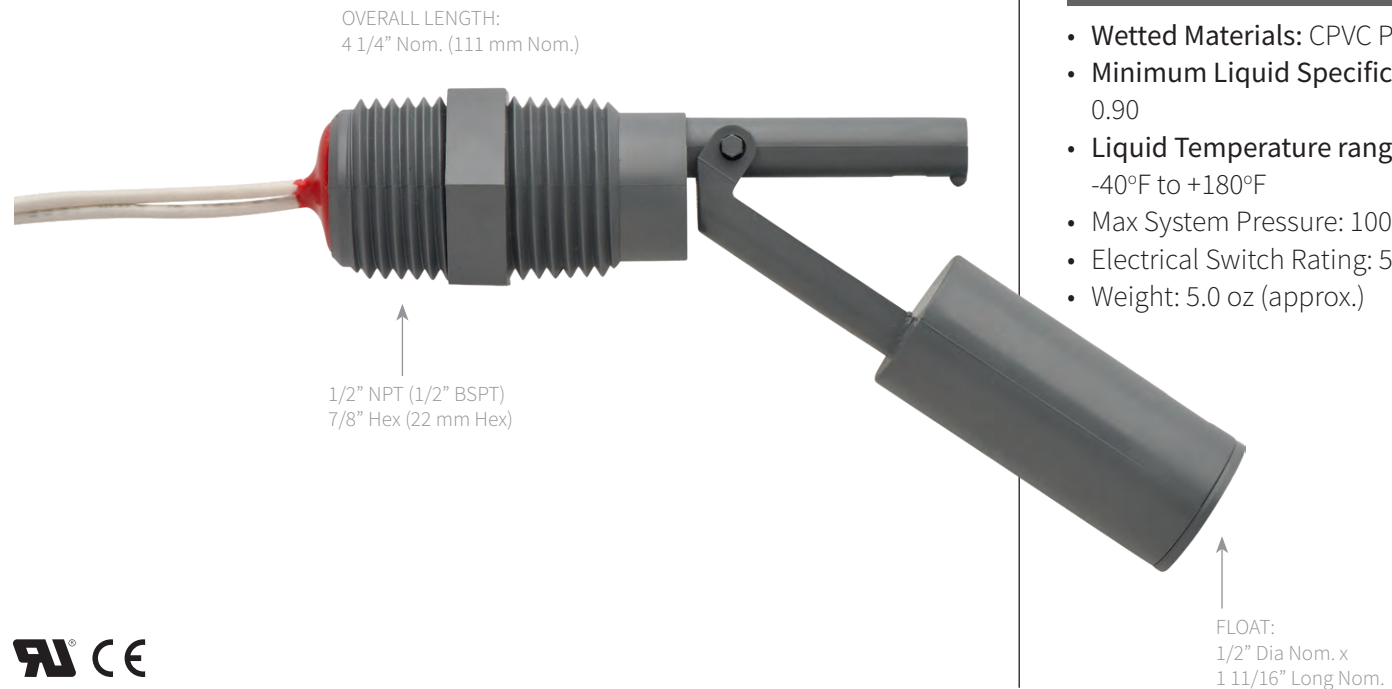
*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

L20/L25

Side Mounted CPVC Plastic Liquid Level Switch

OVERVIEW

The Whitman Controls L20/L25 Series Side Mounted CPVC Plastic Liquid Level Switches are typically used in water and potable water applications. The side mount provides added versatility, allowing the switch to be used as a high or low level indicator, and plastic body provides use up to 100 PSI. These are most often used in many O.E.M. and various other custom industrial applications. These are available with several options as specified by the user.



PERFORMANCE CHARACTERISTICS

	L20 Series	L25 Series
Fitting	1/2" NPT	1/2" BSPT
Wetted Materials	CPVC	CPVC
Electrical Switch Rating	50 VA	50 VA
Temperature Range	-40°F to +180°F	-40°C to +82°C
Minimum Liquid Specific Gravity	0.90	0.90
Crush Pressure	100 PSI	7 BAR
Lead Wires	20 AWG 24" PVC	20 AWG 600mm PVC
Part Number	L20-16-S1-16-NO	L25-16-S1-16-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- CPVC Plastic
- Side mounted
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

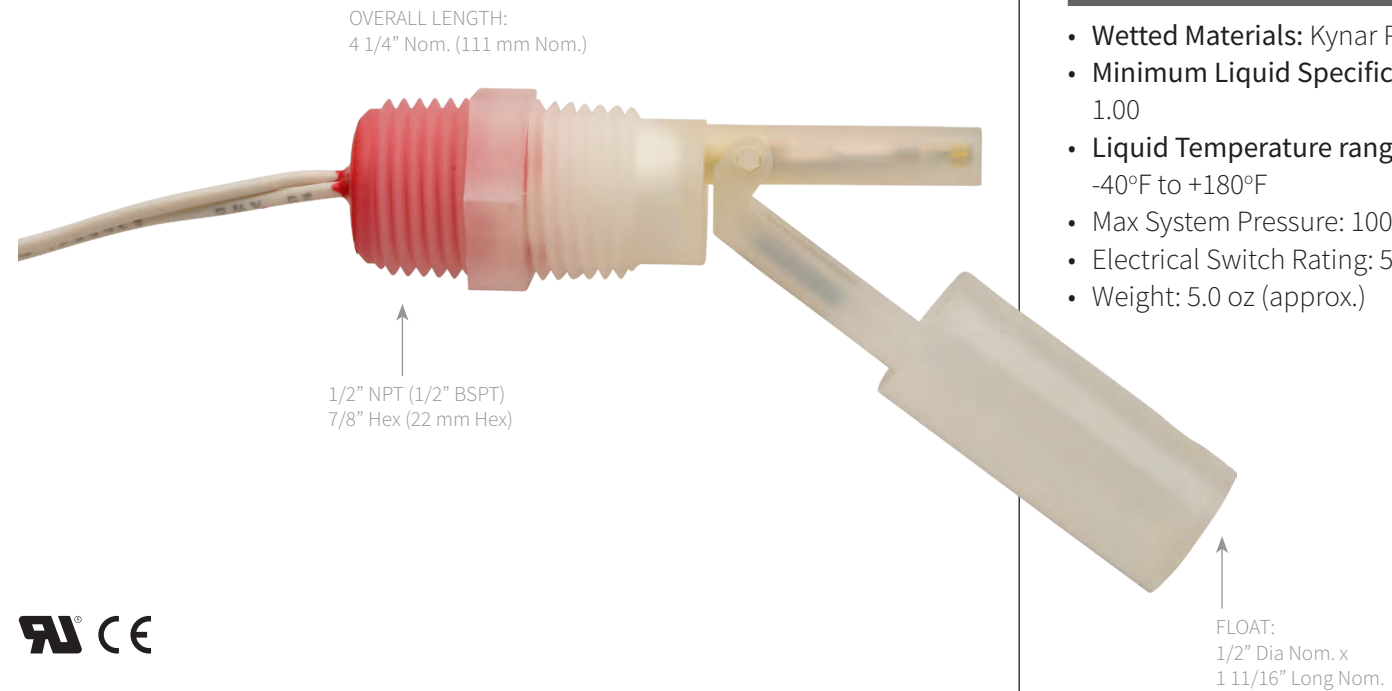
- **Wetted Materials:** CPVC Plastic
- **Minimum Liquid Specific Gravity:** 0.90
- **Liquid Temperature range:** -40°F to +180°F
- Max System Pressure: 100 PSIG
- Electrical Switch Rating: 50 VA
- Weight: 5.0 oz (approx.)

L20/L25

Side Mounted Kynar Plastic Liquid Level Switch

OVERVIEW

The Whitman Controls L20/L25 Series Side Mounted Kynar Plastic Liquid Level Switches are typically used with solvents and certain bases. The side mount provides added versatility, allowing the switch to be used as a high or low level indicator, and plastic body provides use up to 100 PSI. These are most often used in many O.E.M. and various other custom industrial applications. These are available with several options as specified by the user.



PERFORMANCE CHARACTERISTICS

	L20 Series	L25 Series
Fitting	1/2" NPT	1/2" BSPT
Wetted Materials	Kynar	Kynar
Electrical Switch Rating	50 VA	50 VA
Temperature Range	-40°F to +180°F	-40°C to +82°C
Minimum Liquid Specific Gravity	1.00	1.00
Crush Pressure	100 PSI	7 BAR
Lead Wires	20 AWG 24" PVC	20 AWG 600mm PVC
Part Number	L20-17-S1-17-NO	L25-17-S1-17-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- Kynar Plastic
- Side mounted
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

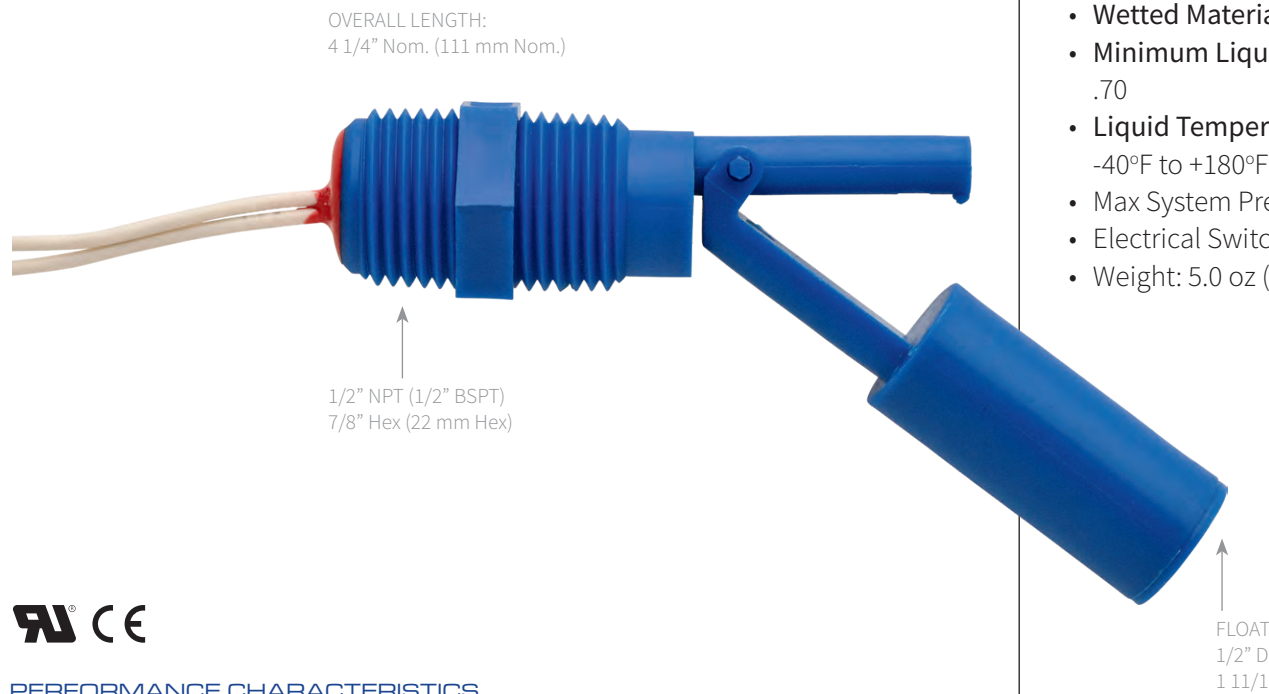
- **Wetted Materials:** Kynar Plastic
- **Minimum Liquid Specific Gravity:** 1.00
- **Liquid Temperature range:** -40°F to +180°F
- Max System Pressure: 100 PSIG
- Electrical Switch Rating: 50 VA
- Weight: 5.0 oz (approx.)

L20/L25

Side Mounted Polypropylene Liquid Level Switch

OVERVIEW

The Whitman Controls L20/L25 Series Side Mounted Polypropylene Liquid Level Switches are among the most versatile and durable of the side-mounted liquid level switch line. The polypropylene wetted material makes the switch highly compatible with numerous liquids from acids, to water, to bases. The side mount provides added versatility, allowing the switch to be used as a high or low level indicator, and plastic body provides use up to 100 PSI. These are most often used in many O.E.M. applications. These are available with several options as specified by the user.



PERFORMANCE CHARACTERISTICS

	L20 Series	L25 Series
Fitting	1/2" NPT	1/2" BSPT
Wetted Materials	Polypropylene	Polypropylene
Electrical Switch Rating	50 VA	50 VA
Temperature Range	-40°F to +180°F	-40°C to +82°C
Minimum Liquid Specific Gravity	0.70	0.70
Crush Pressure	100 PSI	7 BAR
Lead Wires	20 AWG 24" PVC	20 AWG 600mm PVC
Part Number	L20-20-S1-20-NO	L25-20-S1-20-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- Polypropylene
- Side mounted
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** Polypropylene
- **Minimum Liquid Specific Gravity:** .70
- **Liquid Temperature range:** -40°F to +180°F
- Max System Pressure: 100 PSIG
- Electrical Switch Rating: 50 VA
- Weight: 5.0 oz (approx.)

L30

Vertical Multi-Station Stainless Steel Liquid Level Switch

OVERVIEW

The Whitman Controls L30 Series Vertical Multi-Station Stainless Steel Liquid Level Switches provide the user with as many as five level control points and up to 48" in overall length. The structure allows these switches to be mounted at the top or bottom of a tank. It can be fully customized to meet various tank sizes and switch requirements, and has assorted reversible polarities and wiring possibilities. These are most commonly found in potable water, hot water, acids, and various solvent applications.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- 316L Stainless Steel
- Up to 5 level control points
- Up to 48" in overall length
- Reversible polarities & wiring possibilities

SPECIFICATIONS

- **Wetted Materials:** 316L Stainless Steel
- **Fitting:** 1/8" NPT or 1 1/2" NPT
- **Minimum Liquid Specific Gravity:** 0.85
- **Liquid Temperature range:** -40°F to +300°F
- **Max System Pressure:** 1,000 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** Varies based on length and number of floats



Up to 48" Overall Length
Up to 5 Control Points

Please consult factory directly for specification and customization.

**Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0*

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L30

Vertical Multi-Station Brass / Buna Liquid Level Switch

OVERVIEW

The Whitman Controls L30 Series Vertical Multi-Station Brass Buna Liquid Level Switches provide the user with as many as five level control points and up to 48" in overall length. The structure allows these switches to be mounted at the top or bottom of a tank. It can be fully customized to meet various tank sizes and switch requirements, and has assorted reversible polarities and wiring possibilities. These are most commonly used with oil, gasoline, hydraulic oil, and jet fuel. The buna float can be used in oil in temperatures up to 230°F.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- Brass Stem and Buna floats
- Up to 5 level control points
- Up to 48" in overall length
- Reversible polarities & wiring possibilities

SPECIFICATIONS

- **Wetted Materials:** Brass stem, Buna floats
- **Fitting:** 1/8" NPT or 1 1/2" NPT
- **Minimum Liquid Specific Gravity:** 0.70
- **Liquid Temperature range:** -40°F to +180°F (Up to 230°F in oil)
- **Max System Pressure:** 160 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** Varies based on length and number of floats



Up to 48" Overall Length
Up to 5 Control Points



Please consult factory directly for specification and customization.

**Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0*

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

L31

Heavy Duty Vertical Multi-Station Stainless Steel Liquid Level Switch

OVERVIEW

The Whitman Controls L31 Series Heavy Duty Vertical Multi-Station Stainless Steel Liquid Level Switches provide the user with as many as six level control points and up to 72" in overall length. The structure allows these switches to be mounted at the top or bottom of a tank. It can be fully customized to meet various tank size and switch requirements, and has assorted reversible polarities and wiring possibilities. These are most commonly found in potable water, hot water, acids, and various solvent applications.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- 316L Stainless Steel
- Up to 7 level control points
- Up to 72" in overall length
- Reversible polarities & wiring possibilities

SPECIFICATIONS

- **Wetted Materials:** 316 / 316L Stainless Steel
- **Fitting:** ½" NPT, 2" NPT, or 3" 150# Flange
- **Minimum Liquid Specific Gravity:** 0.85
- **Liquid Temperature range:** -40°F to +300°F
- **Max System Pressure:** 975 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** Varies based on length and number of floats



Up to 72" Overall Length
Up to 6 Control Points



Please consult factory directly for specification and customization.

**Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
CAUTION: Customer Media and environment must be compatible with construction materials as outlined above*

L40

Vertical Mount 1" Cylinder Stainless Steel Liquid Level Switch

OVERVIEW

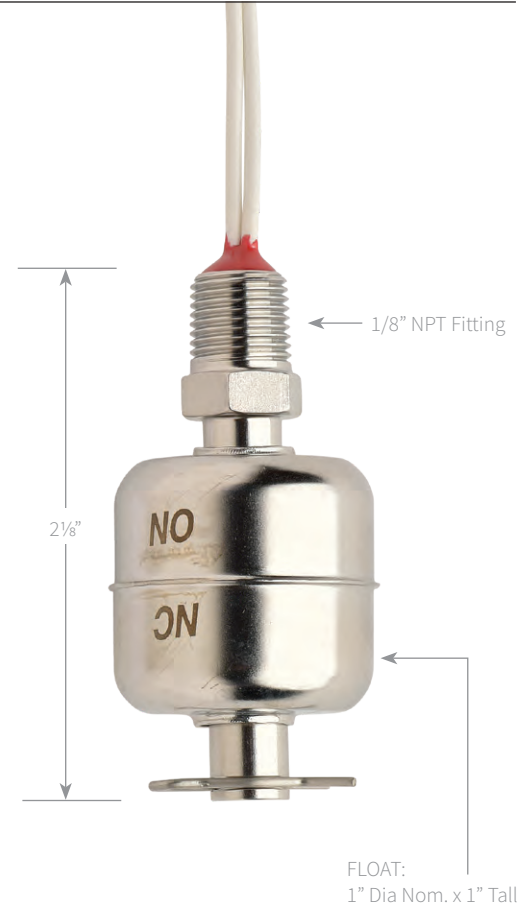
The Whitman Controls L40 Series Vertical Mount 1" Cylinder Stainless Steel Liquid Level Switch has both a stainless steel stem and float affording the user high performance and versatility. These levels are most commonly seen in OEM and various other industrial applications. These are used in potable water, hot water, and in various acids and solvents as the Whitman Red Seal potting affords submergibility to a NEMA 6 rating.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- 316L Stainless steel stem and float
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** 316L Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.80
- **Liquid Temperature range:** -40°F to +300°F
- **Max System Pressure:** 900 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)



PERFORMANCE CHARACTERISTICS

	L40 Series
Fitting	1/8" NPT
Wetted Materials	316L SS
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +257°F
Minimum Liquid Specific Gravity	0.90
Crush Pressure	900 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L40-02-C1-02-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

L40

Vertical Mount 1" Sphere Stainless Steel Liquid Level Switch

OVERVIEW

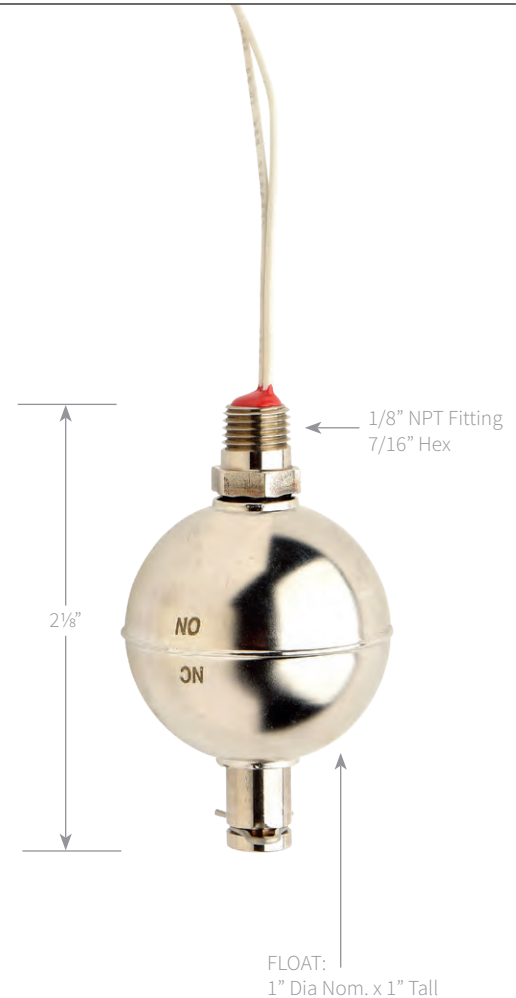
The Whitman Controls L40 Vertical Mount 1" Sphere Stainless Steel Liquid Level Switches have both a stainless steel stem and float affording the user high performance and versatility. These levels differ from their L40 cylinder cousin in that they feature a 1" sphere float and can withstand a greater crush pressure up to 1,000 PSI (69 BAR). These levels are most commonly seen in OEM and various other industrial applications. These are used in potable water, hot water, and in various acids and solvents as the Whitman Red Seal potting affords submergibility to a NEMA 6 rating.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- 316L Stainless steel stem and float
- 1" sphere float
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** 316L Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.77
- **Liquid Temperature range:** -40°F to +300°F
- **Max System Pressure:** 1,000 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)
- **Float:** Spherical, 1" Diameter



PERFORMANCE CHARACTERISTICS

	L40 Series
Fitting	1/8" NPT
Wetted Materials	316L SS
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +257°F
Minimum Liquid Specific Gravity	0.85
Crush Pressure	1000 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L40-02-R1-02-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

L40

Vertical Mount Brass/Buna Liquid Level Switch

OVERVIEW

The Whitman Controls L40 Series Vertical Mount Brass/Buna Liquid Level Switches are most commonly seen in OEM applications and other industrial inputs. The brass stem and buna float makes the switch ideal for oil, gasoline, hydraulic oil, and jet fuel applications, and can survive to 230°F in oil.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- Brass stem, Buna float
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** Brass stem, Buna float, 316 Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.70
- **Liquid Temperature range:** -40°F to +180°F (230°F / 110°C in oil)
- **Max System Pressure:** 160 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)
- **Float:** Cylindrical, 1" Diameter

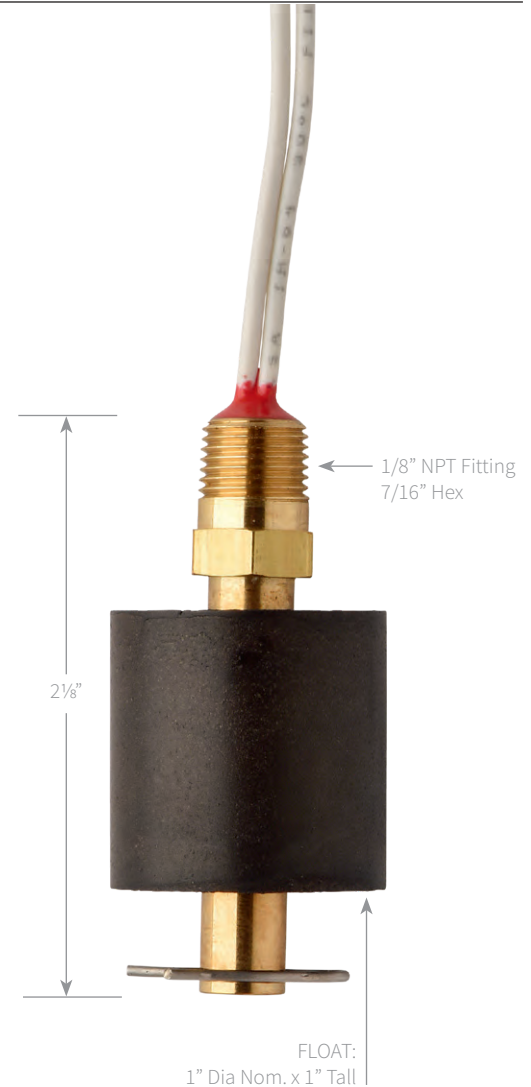
PERFORMANCE CHARACTERISTICS

	L40 Series
Fitting	1/8" NPT
Wetted Materials	Brass, Buna, 316 SS
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +180°F**
Minimum Liquid Specific Gravity	0.70
Crush Pressure	160 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L40-06-C1-15-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

** Unit is rated to 230°F / 110°C in oil

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L40

Vertical Mount CPVC Plastic Liquid Level Switch

OVERVIEW

The Whitman Controls L40 Series Vertical Mount CPVC Plastic Liquid Level Switches are light-weight typically used in water and potable water applications. Despite the size and weight, these levels are durable to 100 PSIG and submersible to a NEMA 6 rating. They can be used in numerous O.E.M. and various other industrial applications and are available with numerous options.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- CPVC Plastic
- Extensive operating temperature range
- SPST availability

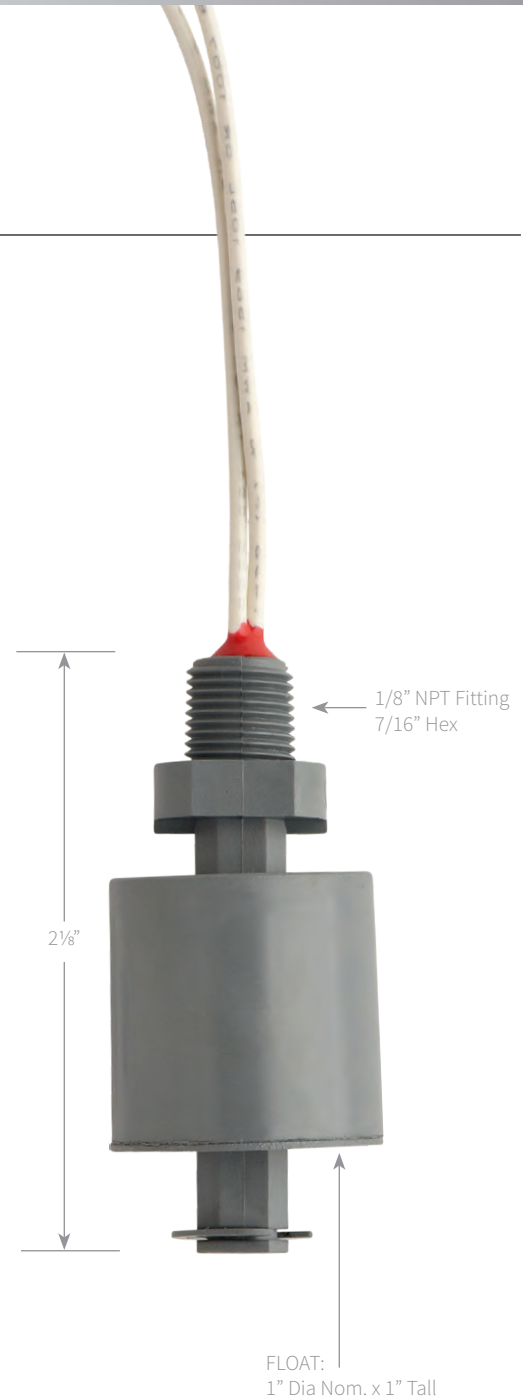
SPECIFICATIONS

- **Wetted Materials:** CPVC – Gray
- **Minimum Liquid Specific Gravity:** 0.85
- **Liquid Temperature range:** -40°F to +180°F
- **Max System Pressure:** 100 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)

PERFORMANCE CHARACTERISTICS

	L40 Series
Fitting	1/8" NPT
Wetted Materials	CPVC
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +180°F
Minimum Liquid Specific Gravity	0.85
Crush Pressure	100 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L40-16-C1-16-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L40

Vertical Mount Kynar Plastic Liquid Level Switch

OVERVIEW

The Whitman Controls L40 Series Vertical Mount Kynar Plastic Liquid Level Switches are light-weight levels typically used in solvents and certain bases. The switch can be subjected to 100 PSIG and the Whitman Red Seal potting makes the switch submersible to a NEMA 6 rating. They can be applied to numerous O.E.M. and various other industrial applications and are available with a number of options.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- Kynar Plastic
- Extensive operating temperature range
- SPST availability

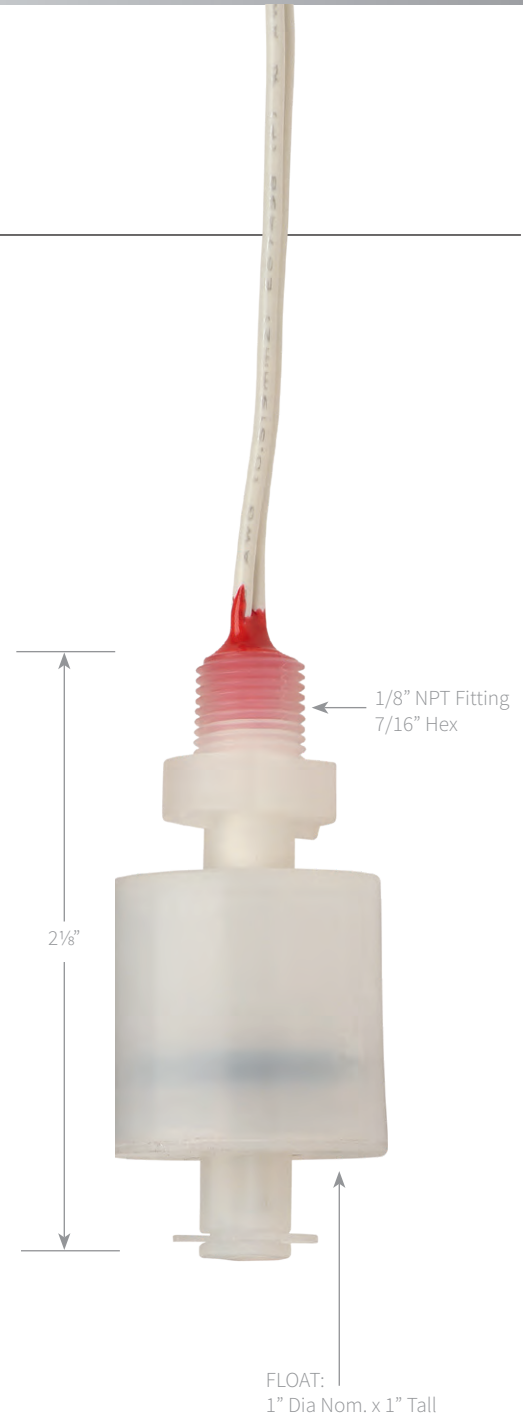
SPECIFICATIONS

- **Wetted Materials:** Kynar – White
- **Minimum Liquid Specific Gravity:** 1.00
- **Liquid Temperature range:** -40°F to +180°F
- **Max System Pressure:** 100 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)

PERFORMANCE CHARACTERISTICS

	L40 Series
Fitting	1/8" NPT
Wetted Materials	Kynar
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +180°F
Minimum Liquid Specific Gravity	1.00
Crush Pressure	100 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L40-17-C1-17-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L40

Vertical Mount Polypropylene Liquid Level Switch

OVERVIEW

The Whitman Controls L40 Series Vertical Mount Polypropylene Plastic Liquid Level Switches are among the most versatile and durable of the vertical liquid level switch line. The polypropylene wetted material makes the switch highly compatible with numerous liquids from acids, to water, to bases. These can be used in numerous O.E.M. and various other industrial applications and are available with numerous options.

KEY FEATURES

- Whitman Red Seal potting submersible to a NEMA 6 rating
- Polypropylene Plastic
- Extensive operating temperature range
- SPST availability

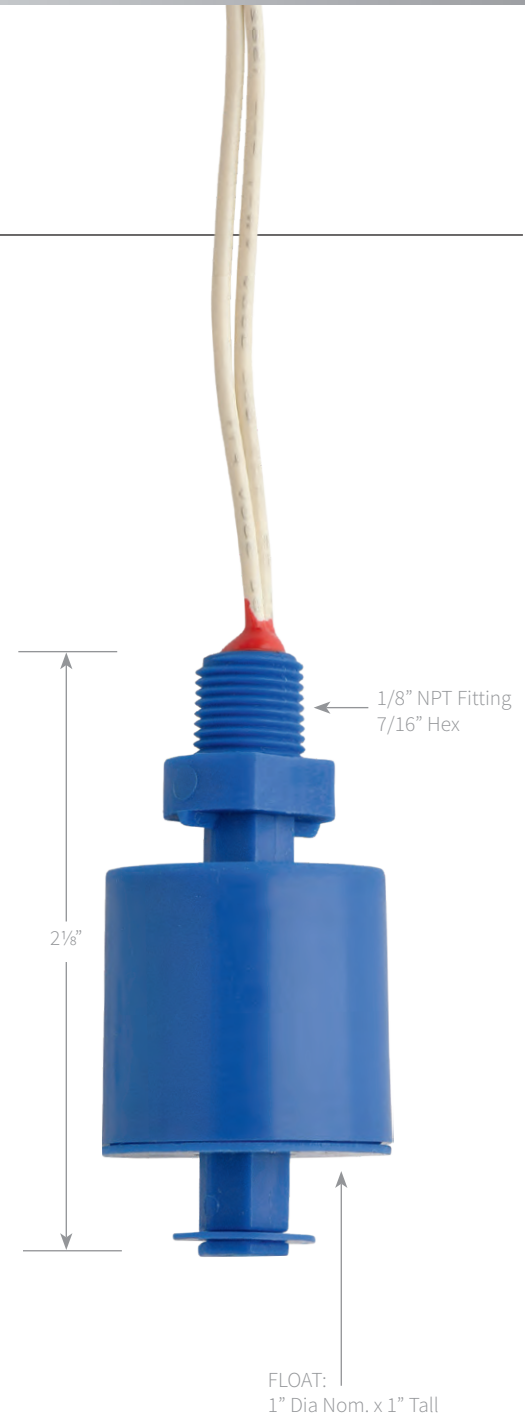
SPECIFICATIONS

- **Wetted Materials:** Polypropylene – Blue
- **Minimum Liquid Specific Gravity:** 0.70
- **Liquid Temperature range:** -40°F to +180°F
- **Max System Pressure:** 100 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)

PERFORMANCE CHARACTERISTICS

	L40 Series
Fitting	1/8" NPT
Wetted Materials	Polypropylene
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +180°F
Minimum Liquid Specific Gravity	0.70
Crush Pressure	100 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L40-20-C1-20-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L54/L55

Bent Stem Side Mount Stainless Steel Liquid Level Switch

OVERVIEW

The Whitman Controls L54/L55 Series Bent Stem Side Mount Stainless Steel Liquid Level Switches have $\frac{3}{8}$ "-24 straight thread (L54) or $\frac{1}{8}$ " NPT thread (L55) fittings allowing for insertion into the sides of topless tanks and for vertical actuation. The stainless steel wetted material in addition to the bent stem provide for maximum versatility and use across numerous applications. They are most commonly used in potable water, acids, and various solvents.

KEY FEATURES

- Side mounted with the ability to actuate vertically
- 316L Stainless steel stem and float
- Whitman Red Seal potting submersible to a NEMA VI rating
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** 316L Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.90
- **Liquid Temperature range:** -40°F to +300°F
- **Max System Pressure:** 900 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)



(Shown: L55 with $\frac{1}{8}$ " NPT)



PERFORMANCE CHARACTERISTICS

	L54 Series	L55 Series
Fitting	$\frac{3}{8}$ "-24 UNF 2A Thread	$\frac{1}{8}$ " NPT
Wetted Materials	316L SS	316L SS
Electrical Switch Rating	50 VA	50 VA
Temperature Range	-40°F to +257°F	-40°C to +257°C
Minimum Liquid Specific Gravity	0.90	0.90
Crush Pressure	400 PSI	400 PSI
Lead Wires	20 AWG 24" PVC	20 AWG 24" PVC
Part Number	L54-02-C1-02-NO	L55-02-C1-02-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

L60

Heavy Duty Vertical Mount 2" Sphere Stainless Steel Liquid Level Switch

OVERVIEW

The Whitman Controls L60 Series Heavy Duty Vertical Mount 2" Sphere Stainless Steel Liquid Level switch consists of a stainless steel stem and float which afford the end user maximum versatility in functionality and operating environment. These levels can withstand system pressure to 975 PSIG (67 BAR) and an extensive temperature operating range. They are commonly used in potable water, hot water, and in various acids and solvents.

KEY FEATURES

- 316L Stainless steel stem and float affording maximum versatility
- Whitman Red Seal potting submersible to a NEMA VI rating
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** 316L Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.80
- **Liquid Temperature range:** -40°F to +300°F
- **Max System Pressure:** 975 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)

PERFORMANCE CHARACTERISTICS

	L60 Series
Fitting	1/4" NPT
Wetted Materials	316L SS
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +257°F
Minimum Liquid Specific Gravity	0.80
Crush Pressure	975 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L60-02-R2-02-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L60

Heavy Duty Vertical Mount Brass/Buna Liquid Level Switch

OVERVIEW

The Whitman Controls Heavy Duty Vertical Mount Brass/Buna Liquid Level Switch is constructed with a brass stem and buna float, which allows these switches to operate in harsh, high temperature environments relative to its stainless steel cousin. The unit is rated to 230°F /110°F in oil. The L60 is commonly used in oil, gasoline, hydraulic oil, and jet fuel applications, and can survive up to 230°F in oil.

KEY FEATURES

- Brass stem and buna float
- Whitman Red Seal potting submersible to a NEMA VI rating
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** Brass stem, Buna float, 316L Stainless Steel
- **Minimum Liquid Specific Gravity:** 0.75
- **Liquid Temperature range:** -40°F to +180°F (230°F / 110°C in oil)
- **Max System Pressure:** 160 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)
- **Float:** Cylindrical, 2" Diameter

PERFORMANCE CHARACTERISTICS

	L60 Series
Fitting	1/4" NPT
Wetted Materials	Brass, Buna, 316 SS
Electrical Switch Rating	50 VA
Temperature Range	-40°F to +180°F
Minimum Liquid Specific Gravity	0.75
Crush Pressure	160 PSI
Lead Wires	20 AWG 24" PVC
Part Number	L60-06-C3-15-NO

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



L70

Mini Polypropylene Vertical Mount Liquid Level Switch

OVERVIEW

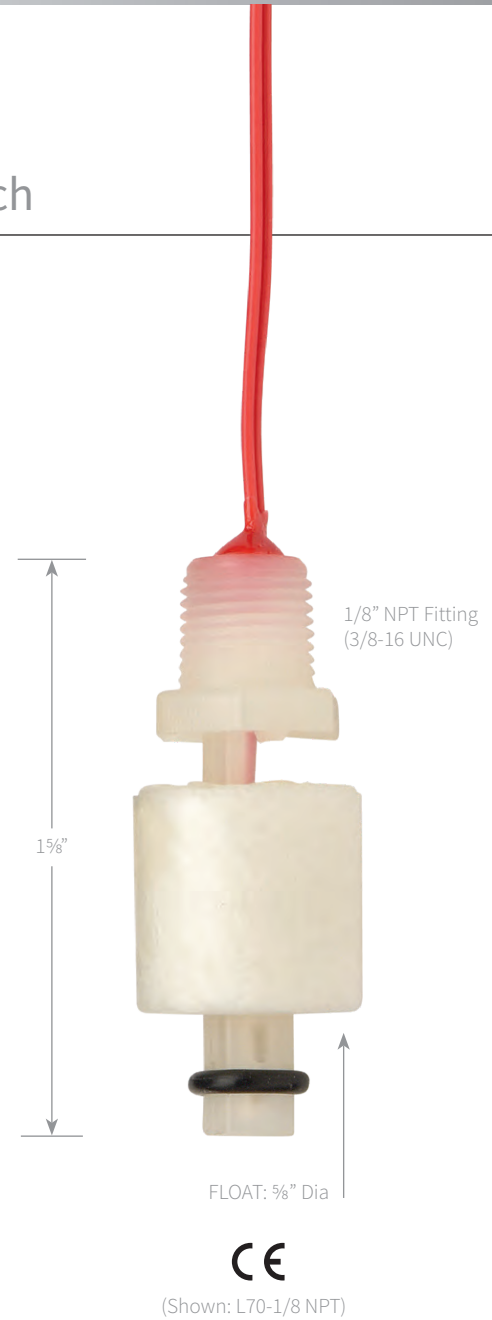
The Whitman Controls L70 Series Mini Polypropylene Vertical Mount Liquid Level Switches are miniature in size, allowing for use across a wide range of industrial applications. These liquid levels are highly compatible with numerous liquids from acids to waters to bases. They are normally open-only switches for O.E.M. applications and are available with 1/8" NPT and 3/8-16 straight threads.

KEY FEATURES

- Miniature size, allowing for use across a number of applications
- Brass stem and buna float
- Whitman Red Seal potting submersible to a NEMA VI rating
- Polypropylene plus FDA Foaming Agent float
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Wetted Materials:** Polypropylene & Buna
- **Float:** Polypropylene plus FDA Foaming Agent
- **Fitting:** 1/8" NPT or 3/8-16 UNC Straight
- **Minimum Liquid Specific Gravity:** 0.77
- **Liquid Temperature range:** -40°F to +176°F
- **Max System Pressure:** 100 PSIG
- **Electrical Switch Rating:** 50 VA Normally Open (N.O.) Dry
- **Weight:** 1.0 oz (approx.)



PERFORMANCE CHARACTERISTICS

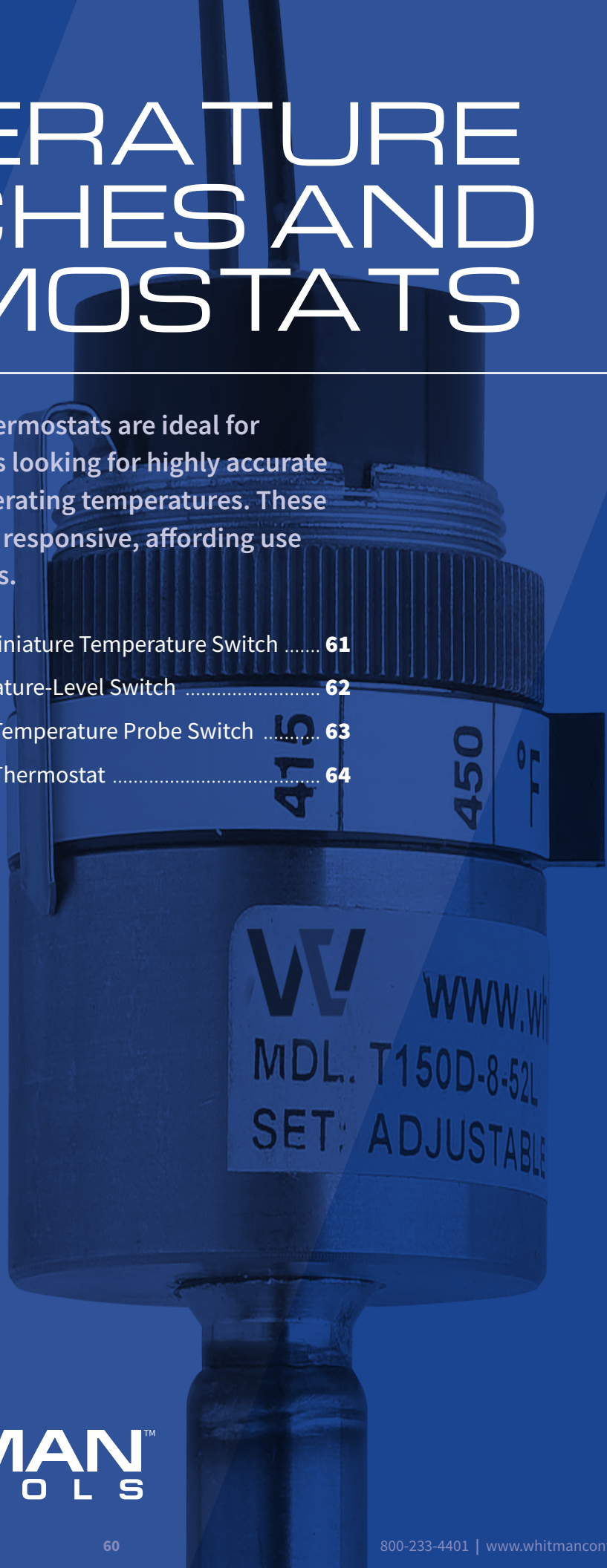
	L70-1/8 NPT Series	L70-3/8-16 Series
Fitting	1/8" NPT Pipe Thread	3/8-16 UNC Straight
Wetted Materials (Stem & O-Ring)	Polypropylene, Buna	Polypropylene, Buna
Wetted Materials (Float)	Polypropylene, FDA foaming agent	Polypropylene, FDA foaming agent
Electrical Switch Rating	50 VA Normally Open (N.O.) Dry	50 VA
Temperature Range	-40°F to +176°F	-40°F to +176°F
Minimum Liquid Specific Gravity	0.77	0.77
Crush Pressure	100 PSIG	100 PSIG
Lead Wires	24 AWG Teflon 24"	24 AWG Teflon 24"

*Actuation point is roughly midway of float travel in liquid with a specific gravity of approximately 1.0
 CAUTION: Customer Media and environment must be compatible with construction materials as outlined above

TEMPERATURE SWITCHES AND THERMOSTATS

Our temperature switches and thermostats are ideal for applications where the end user is looking for highly accurate control across a wide range of operating temperatures. These sensors are adjustable and highly responsive, affording use across a number of OEM processes.

T150D	Adjustable Stainless Steel Miniature Temperature Switch	61
L10	Vertical Brass Buna Temperature-Level Switch	62
TP Series	Economical Stainless Steel Temperature Probe Switch	63
T3	Economical Stainless Steel Thermostat	64



T150D

Adjustable Stainless Steel Miniature Temperature Switch

OVERVIEW

The Whitman Controls T150D Adjustable Stainless Steel Miniature Temperature Switches provide the end-user with a wide range of functionality without impacting durability. The T150 is designed for use up to 510°F but can withstand temperatures up to 800°F while still protecting the set point and life of the switch. The limit filled, saturated vapor sensor is in direct contact with the temperature-sensing outer shell producing fast response and accurate temperature control. The external setting scale provides full range adjustment and the external lock screw allows for easy adjustment of set point. The stainless steel wetted material affords use in any number of processes from medical to food processing, to oil baths and refrigeration.

KEY FEATURES

- Miniature size
- 9 ranges of adjustability from -45°F to +510°F
- Will withstand over temperatures without affecting set point or life of switch
- External lock screw for easy adjustment of set point
- Vibration resistant
- Direct mount offers thermal isolation between electrical switch and sensor
- Numerous electrical interfaces available

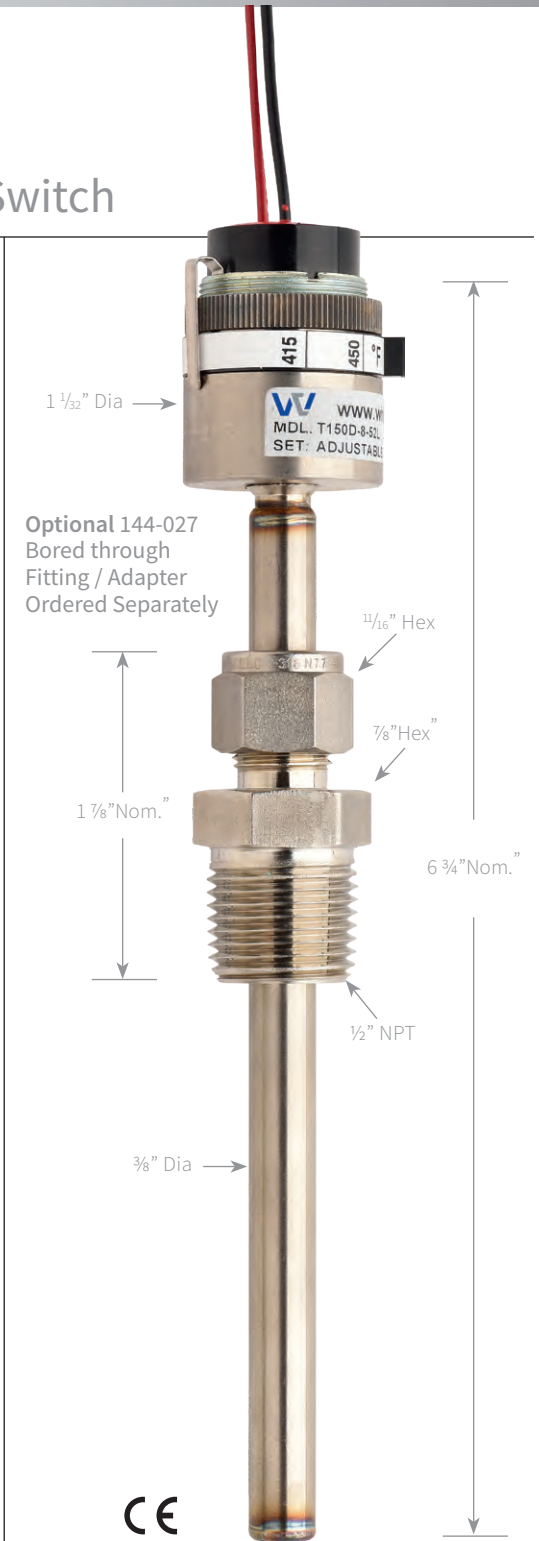
SPECIFICATIONS

- **Max System Temperature:** 800°F
- **Max System Pressure:** 1,000 PSI
- **Temperature Range:** -45°F to +510°F (Up to 230°F in oil)
- **Temperature Sensor:** Limit filled, saturated vapor sensor
- **Switch Body Ambient Temperature Limits:** -65°F to +225°F
- **Wetted Parts:** 316 Stainless Steel

SENSOR CODE AND PERFORMANCE CHARACTERISTICS

CODE TEMP RANGE	ADJUSTABLE SET POINT RANGE	REPEATABILITY	MAXIMUM TEMPERATURE*
	°F	°F	°F
1	-45 to +20	± 1.3	200
2	-15 to +65	± 1.6	250
3	+25 to +95	± 1.4	300
4	+80 to +160	± 1.6	350
5	+130 to +220	± 1.8	450
6	+180 to +260	± 1.6	500
7	+240 to +350	± 2.2	600
8	+345 to +450	± 2.1	700
9	+390 to +510	± 2.4	800

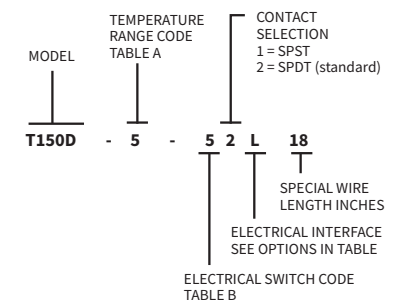
*Maximum temperature is the temperature the sensing bulb may be subjected to without causing changes in the operating characteristics of the switch.



Optional 144-027 Bored through Fitting / Adapter Ordered Separately



CONSTRUCTION OF PART NUMBER



L10

Vertical Brass Buna Temperature-Level Switch

OVERVIEW

The Whitman Controls L10 Series Vertical Mount Brass Buna Temperature-Level Switches are highly versatile, providing the end-user the ability to control both temperature and liquid level within an application. These switches can be used to set off high/low temperature alarms along with a number of other functions. The buna float can be used in numerous liquids and can survive up to 230°F in oil. The internal thermostats are available from 100°F to 225°F in 25°F increments, with special temperatures available for O.E.M. customers. There are numerous wiring combinations and other options available to afford the end-user extreme functionality.

KEY FEATURES

- Highly versatile with temperature and liquid level control
- Whitman Red Seal potting submersible to a NEMA 6 rating
- Extensive operating temperature range
- SPST availability

SPECIFICATIONS

- **Minimum Liquid Specific Gravity:** 0.75
- **Liquid Temperature range:** -40°F to +180°F (-40°F to +230°F in oil)
- **Temperature Settings:** +100°F to +225°F in 25°F increments
- **Repeatability:** +/- 5°F
- **Max System Pressure:** 160 PSIG
- **Electrical Switch Rating:** 50 VA
- **Weight:** 5.0 oz (approx.)
- **Wetted Materials:** Brass stem, buna float

PERFORMANCE CHARACTERISTICS

	L10 Series
Fitting	1/4" NPT, 5/8" Hex
Wetted Materials	Brass, Buna, 316 SS
Electrical Ratings:	
Level Switch:	50 Volt Amps, 1/4 A at 150 VAC
Temp Switch:	8 Amps at 12 VDC, 2.6 Amps at 120 VAC
Temperature Range	-40°F to +180°F
Minimum Liquid Specific Gravity	0.75
Crush Pressure	160 PSIG
Lead Wires	20 AWG 24" PVC

*Response time is approximately 1°F/second and may vary by media and conditions

CAUTION: Customer Media and environment must be compatible with construction materials as outlined above



PART NUMBER CONSTRUCTION:

LXX - 06 - C3 - 15 - NX - XX

O = Level N/O B = Temp N/O
C = Level N/C C = Temp N/C

- | | |
|-------------------------------|-------------|
| 11 = 4 Wire Temp N/O | 2 = 100° F |
| 12 = 4 Wire Temp N/C | 3 = 125° F |
| 13 = 3 Wire Temp N/O | 4 = 150° F |
| 14 = 3 Wire Temp N/C | 5 = 175° F |
| 15 = 2 Wire Temp N/O Series | 6 = 200° F |
| 16 = 2 Wire Temp N/C Series | 7 = 225° F |
| 17 = 2 Wire Temp N/O Parallel | 8 = SPECIAL |
| 18 = 2 Wire Temp N/C Parallel | |

TP SERIES

Economical Stainless Steel Temperature Probe Switch

OVERVIEW

The Whitman Controls TP Series Economical Stainless Steel Temperature Probe Switches are a creep action thermostat/thermal protector switch providing almost no differential between opening and closing temperatures. The switch is designed for use up to 250°F but can withstand temperatures up to 275°F while still protecting the life of the switch. They are available in temperature units from 50°F to 250°F in 25°F increments with special temperatures available for O.E.M. customers. These switches are available wired Normally Closed or Normally Open on increasing temperature. The stainless steel wetted material affords use in any number of processes from medical to food processing, to oil baths and refrigeration. They are all made with 1/2" NPT Male threads so that they can be screwed directly into almost application.

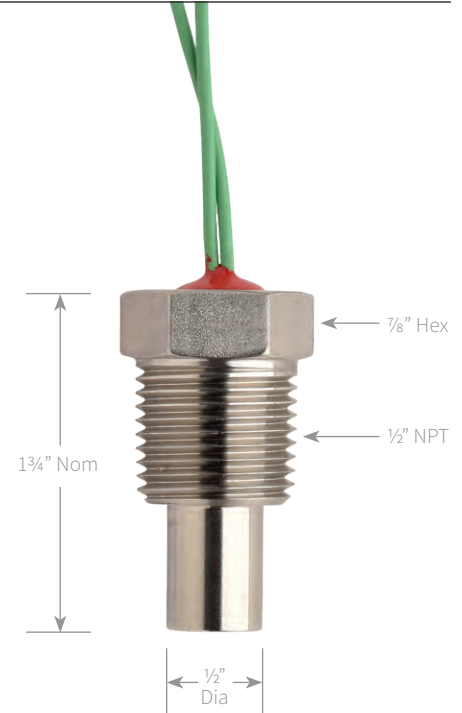
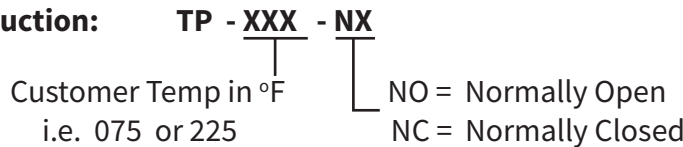
KEY FEATURES

- 316 Stainless Steel
- Extensive temperature operating range
- Will withstand over temperatures without affecting life of switch

SPECIFICATIONS

- Temperature range: +50°F to +250°F
- Max System Temperature: 275°F
- Max System Pressure: 1,000 PSIG
- Wetted Materials: 316 Stainless Steel

Part Number Construction:



T3

Economical Stainless Steel Thermostat

OVERVIEW

The Whitman Controls T3 Economical Stainless Steel Thermostat is a capillary bulb thermostat, with 39" capillary tubes and stainless steel wetted material. These SPDT devices are rated to 10 Amps. The T3 has grown in popularity, frequently used in the medical field and food processing, specifically to control the temperature of foods and various enclosures such as chicken coops. These thermostats are highly versatile and can be panel mounted, affording use across any number of OEM and other industrial applications.



KEY FEATURES

- 316 Stainless Steel
- Capillary bulb thermostat with 39" capillary tubes
- Extensive temperature operating range
- SPDT, rated to 10 Amps

SPECIFICATIONS

- **Wetted Materials:** 316 Stainless Steel
- **Max System Pressure:** 1000 PSIG
- **Temperature range:** +30°F to +190°F
- **Amps:** 10 Amps Max

GENERAL INFORMATION

Electrical Switch Codes 66

Electrical Interface Options 67

Fittings, Adapters and Optional Parts 68

Set point Adjustments & Wiring Instructions 69

Switch Glossary 70

Whitman Value 71



Electrical Switch Selection Tables

ALL MODELS EXCEPT P88, P90 & P95

SWITCH CODE	VOLTS AC / DC	AMP RESISTIVE	AMP INDUCTIVE	CONTACT MATERIAL
.1	125 / 30	.1	-	GOLD PLATE
1	115 / 28	1 / 1	1 / .5	GOLD
3	125 / 30	3 / 2	-	SILVER
5	250 / 28	5 / 5	5 / 3	SILVER

Above switches are SPDT, but may be used as SPST.

MODELS P90 & P95 ONLY

SWITCH CODE	VOLTS	AMP RESISTIVE	HORSE POWER @ 250 VAC	CONTACT MATERIAL
1	30 VDC / 125 VAC	1	-	GOLD
5	30 VDC / 250 VAC	5	-	SILVER
11	30 VDC / 250 VAC	11	1/4	SILVER

Above switches are SPDT, but may be used as SPST.

MODEL P88 ONLY

SWITCH CODE	VOLTS	AMP RESISTIVE	HORSE POWER @ 250 VAC	CONTACT MATERIAL
1	30 VDC / 125 VAC	1	-	GOLD
5	250 VAC	5	0.1	SILVER
10	250 VAC	10	1/3	SILVER
15	250 VAC	15	1/2	SILVER
25	250 VAC	25	2	SILVER

Above switches are SPDT but may be used as SPST. 25 Amp switch available on codes 4, 5, & 6 only.

For dry circuitry, i.e. 5VDC-50 mA or less, use gold contact switch (Code .1 or 1). If less than 20mA, performance of electrical switch will be environmentally dependent. If there is some form of contamination (dust, dirt, oil, chemical residue, etc.) at point of contact, the electrical switch could perform intermittently, as there would be insufficient current to burn off any possible contamination.

Optional Electrical Interfaces

Available for Models

P100, P117, P119, J205, P605, J705 and V117



T
Standard solder type terminals also accept AMP 60789-2 and 60598-4 Pin Receptacles



TS
Three flat bar terminals with #6-32 pan head screws at right angle



TB
3 standard 1/4" terminals accept arc-less (or equal) female quick connect terminals



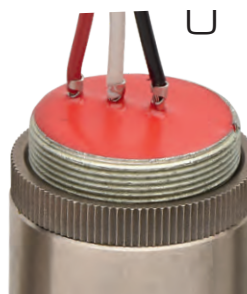
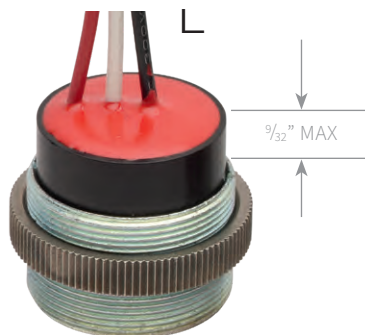
DN
DIN Male Plug "F" Set Only Except "C", "K" & "F" Set on P605 Series Units

For L and U Electrical Interfaces

2 or 3 wire pigtail furnished in 12" length
Standard-supplied #20 AWG Insulated with polyvinyl chloride - 300 volts.

COLOR CODE:

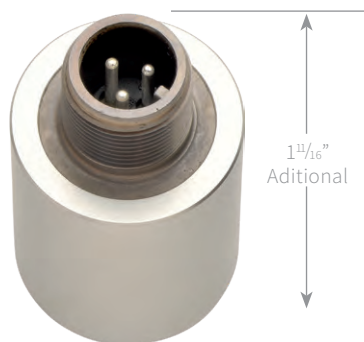
- Black - Common
- White - N.O.
- Red - N.C.



DN Pin-out:
1 = Common
2 = N/C
3 = N/O
Other Pin-outs on request

"M" Interface Quick-Disconnect 3-Pin Connector

This interface is rated as environmentally resisting. It is intended for use where the connector will be subjected to heavy condensation and rapid changes in environmental temperature or pressure. This connector is equivalent to MS3102E-10SL-3P. Applicable to models shown below only.



"M" Interface

P117, J705, J205, P605
"F" Set Only Except "C"
"K" and "F" Set on P605



MS3106E

Connectors - All Models
With "M" Interface

Interface Options

Optional Electrical Interfaces
Available for Model P88



TB
1/4" (TB)
Blade terminals
UL Recognized
CSA Listed



TS
Screw Terminal
UL Listed
(except 25 amp)
CSA Listed

Popular Options:

- **SPECIFIC RESET POINT RANGE** – (Calibrated Switch)
- **PIGTAILS** – Standard, Non-jacketed (“L” Interface)
12” long included in price, longer lengths available
18 AWG, 20 AWG Wire in various colors
- **PIGTAIL WITH PVC JACKET** (“L” Interface)
12” length, longer lengths available
- **UL and/or CSA – Consult Factory**
Some product is covered by UL-CSA approval under the following file numbers: UL E 109178 – CSA LR62173 – P88, P117, W117, P119, J205.
UL E 123402 – CSA LR87500 – Wiring harness
- **PIN RECEPTACLE** – AMP 60598-4 or equal
Three per set (“T” interface)
- **VOLTAGE SPIKE ARRESTOR** – AC/DC Voltage, SPST/SPDT Switches
- **BAR CODING**
- **R/C CIRCUITS FOR CURRENT BELOW 10mA**
- **O-RINGS (J205, P605, J705 only)**
Special materials upon request
- **ROLL STAMPING/STENCILING**
- **COMPUTER DIAGNOSIS CAPABILITY**
- **SHRINK TUBING**
- **CONVOLUTED CONDUIT**
- **LABELING**
- **TEFLON TAPE** – Available on NPT Fittings
- **THREAD LOCKER** – Available on all Fittings

Adapters:

Models P100, P119 and J705 are available with optional port thread adapters.



1/8” NPT to 1/4” NPT



1/8” NPT to 7/16-20 SAE



1/8” NPT to 9/16-18 SAE

Fittings:

Most models can be obtained with a variety of fittings. Some common fittings are shown below. Please specify when ordering.



1/8 NPT Fitting
(Optional for P605)



1/4 NPT Fitting
(Optional for P117, P119 J205, W117)



7/16-20 Thread Fitting
(Optional for P117, J205)



1/4” VCR Fitting
(Optional for P117, W117, J205)



1/2-20 SAE Fitting with Optional O-Ring
(Optional zinc diecast for P90)
(Optional stainless steel for P95)

Set Point Adjustments and Wiring Instructions

SET POINT ADJUSTMENTS

PRESSURE SWITCHES

PRESSURE SET POINT ADJUSTMENT-JAM NUT STYLE ADJUSTING RING MODELS P100, P117, W117, P119, J205, J705 – K OR C SET.

The K & C designs are readily adjustable throughout their prescribed range by loosening the knurled locking ring. Turning the electrical switch clockwise will lower the set point, turning it counterclockwise will increase the set point. When desired set point is reached, the assembly is locked again by tightening the knurled locking ring.

Entire adjustable range may be covered by rotating approximately 250° each side of the mean.

The knurled locking ring requires very little effort to establish a reliable locked position. By placing a wrench on the fitting hex to hold switch body in position, grip the knurled locking ring with pliers and turn counterclockwise to loosen or clockwise to tighten. Only a slight snug is required to lock in position.

VACUUM SET POINT ADJUSTMENT – VACUUM MODELS

To lower set point turn electrical switch counterclockwise. To raise set point turn electrical switch clockwise.

PRESSURE SET POINT ADJUSTMENT – MODEL P605

Slide spring clip cover down past adjusting ring window. Insert .093 inch dia. pin into adjusting ring radial hole. Pushing the pin to the right (counterclockwise) will lower the set point: to the left (clockwise) will raise the set point. Align center of pin holes to the desired pressure. When desired set point is reached, remove pin and slide up the cover to close the adjusting ring window.

PRESSURE SET POINT ADJUSTMENT MODEL P88 K OR C SET

The standard field adjustable versions of the Guardian P/V Model P88 are easily adjusted throughout the prescribed pressure range by aligning the top of the knurled adjusting nut with the desired pressure setting indicated on the adjacent range scale.

PRESSURE SET POINT FOR ADJUSTABLE SWITCHES

All switches are easy to adjust. First, loosen the knurled locking ring. Now, set the sliding gauge pointer to the desired pressure point. Tighten the locking ring and the pressure (vacuum) switch is locked and ready to use.

NOTE: Little effort is required to establish a reliable locked position. If tools are used, place a wrench on the hex nut under the switch to hold the switch body in place; then grip the knurled locking ring with pliers to tighten or loosen as desired.

Loosen knurled ring, set pointer to desired pressure and tighten ring to hold in position.



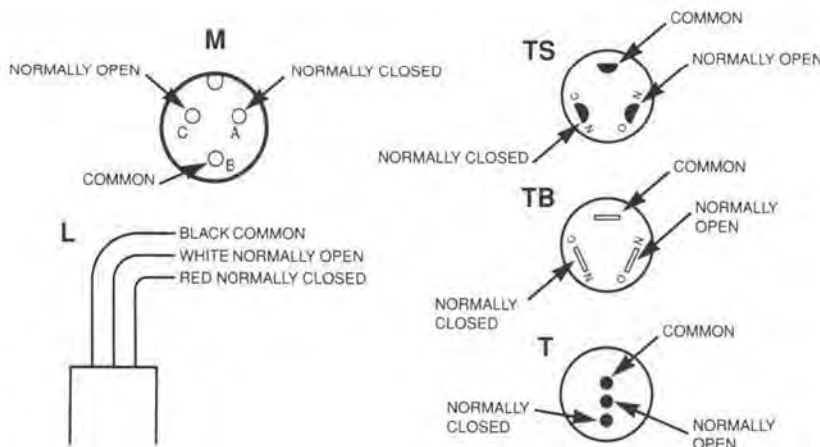
Knurled Locking Ring

On P605 Models, insert the pin (provided) into the adjusting ring and align center of pin holes to the desired pressure.



WIRING INSTRUCTIONS

MODELS P90, P95, P100, P117, P119, J205, J705, P605, W117



MODEL P88

Type TB [Terminal Blades]



Type TS [Terminal Screws]



ACCURACY - The limit of deviation from the set point of a pressure or vacuum switch. It is usually defined in either pounds per square inch, or percentage of full scale.

ACTUATION POINT - See SET POINT. **ACTUATION VALUE** - The difference between the set point and the reset point.

ADJUSTABLE RANGE - The range within which the switch can be set from the lowest to the highest point, usually expressed in PSI, inches of mercury or PSIA.

BUOYANT FORCE - A body submerged in fluid is pushed or buoyed up by a force equal in magnitude to the weight of the displaced fluid. Buoyancy is dependent on both weight and shape of the float.

CRUSH PRESSURE - The maximum pressure to which the floats may be exposed without deformation. Tanks containing liquids are frequently pressurized. Crush pressure varies with the materials of construction, wall thickness, shape and desired density.

DEADBAND - The difference between the increasing and decreasing readings when the switch is operated between set point and reset point.

DIFFERENTIAL - The mechanical motion lost within the electrical switch element while it reverses itself. This is usually greater in high amperage switches than in low amperage switches.

ELECTRICAL RATINGS - The reed switches are specified as VA (Volt Amps) or Watts. See Table A.

ELECTRICAL SWITCHING ELEMENT - Opens or closes an electrical circuit in response to movement from the pressure or vacuum sensing element. Single pole, double throw (SPDT) snap action switches are standard, may be used as single pole, single throw (SPST). NO/NC circuitry is selectable, but it must be specified at order time.

FLOAT - The liquid level sensor, the portion of the level switch that rises and falls with the changes in the level of a liquid. The float contains the magnet used to operate the reed switch. It is made of various materials and densities to achieve a material compatibility and to be able to float in liquids with various specific gravities.

FORM A SWITCH - A single pole single throw electrical switch - the preferred electrical switch for liquid level devices.

FORM C SWITCH - A single pole double throw electrical switch.

HYSTERESIS - The difference in pressure or vacuum switch response to increasing or decreasing pressure or vacuum.

INTERFACE - The surface between two liquids that have different Specific Gravities, e.g. oil floating on water.

INTERFACED - A float whose buoyancy has been adjusted to float at the interface of the two liquids that have different Specific Gravities.

LIQUID LEVEL SWITCH - An electromechanical device that opens or closes an electrical circuit in response to a change in the level of a liquid.

LIQUID LEVEL SWITCH OPERATION - A float containing a permanent magnet riding on the surface of a liquid. The motion of the float is guided by a stem. The stem contain a reed switch that is actuated by the magnet in the float.

MOISTURE PROTECTION - Our liquid level switches are sealed with potting compound. The only path for liquid to the electrical switch would be through the wires. If the wires are terminated in an appropriate manner (e.g. - NEMA VI connectors), the level switch will meet or exceed NEMA VI.

NEMA VI - A device suitable for submersion.

NORMALLY CLOSED SWITCHING ELEMENT - Current flows through the switch until it is broken by a pressure or vacuum change.

NORMALLY OPEN SWITCHING ELEMENT - No current flows through the switch until contact is made by a pressure or vacuum change.

PRESSURE, ABSOLUTE - A pressure scale based on PSIA "0" or a perfect vacuum.

PRESSURE, AMBIENT - The pressure immediately surrounding a pressure switch. It is usually, but not necessarily, atmospheric gauge pressure.

PRESSURE, ATMOSPHERIC - The pressure caused by the actual weight of the earth's atmosphere. At sea level, atmospheric pressure equals 14.7 psi, 30 inches of mercury, or 408 inches of water, above absolute "0" ("0" PSIA).

WHITMAN VALUE

High Quality Switches, Fully Customizable, with an Unrelenting Focus on Superior Service

Whitman Controls has been a leader in the pressure, vacuum, and liquid level switch industry for over 40 years. The Whitman Value is built on our differentiated offering of high quality switches, and the ability to deliver product to EXACT customer specifications in two weeks or less. Off the shelf switches limit an application's functionality and versatility – Why choose a competitor switch that results in inferior performance? We take into account your application and media environment, as well as all desired specifications to design a switch that will meet performance needs and exceed your expectations. Quality switches, designed to customer specifications in two weeks or less, with an unrelenting focus on superior service - Together they add up to the Whitman Value.

ISO 9001 Certified – We Hold Ourselves, and Our Products, to the Highest Standards

Whitman Controls is ISO 9001:2015 Certified, which gives our customers the confidence that we hold our internal processes, and products, to the highest standards of quality and rigorous testing requirements. You can be confident that the product you receive has met all necessary regulatory requirements and will outperform your desired expectations.

Experience and Knowledge, That's Invaluable.

Whitman Controls directs its years of design and manufacturing experience toward providing value-added services to our customers. These services can help you lower costs and increase efficiency. Our engineering team will work intimately with you and your team to design a switch that will maximize application performance no matter what the environment. In addition, our exceptional mechanical abilities allow us to perform additional assemblies and deliver more complete tested systems and subassemblies.

Diversified Product Offering – More Choices and More Savings.

We offer the most extensive pressure, vacuum, and liquid level switch offering in the industry. What does this mean for you? The ability to identify a switch that is suited perfectly for your application at a price that doesn't break your budget. At Whitman, we are constantly evaluating our input prices to identify savings we can pass along directly to the buyer. And we do all of this without sacrificing performance and quality.

Numerous Choices and Additional Options – Have it your Way.

Need additional wire on top of the 12" standard offering? Looking for a 1/4" NPT fitting instead of 1/8" NPT? Need Teflon tape or Loctite Vibraseal on your fitting? These are just a few of the numerous additional options that are available to customers on all our switch offerings. You have a need and we have an answer. All our switches can be customized to meet any end-user requirements.

At the Other End, Whitman Can Handle Wire Harness Assemblies Too.

As a UL and CSA approved harness assembly house, Whitman can do your next level of assembly. With our capabilities we can provide "value-added" benefits top to bottom. Whitman can guarantee leak free subassemblies and can handle a wide variety of switch mounts in customer designed systems. From T's to elbows, we will purchase and assemble parts and switches to your specifications.

Plus we can do it all at a price that will save you money. Call or email us today and we will give you a quotation on your assembly project.

Quality products, fully customizable, with a commitment to superior service. Together they add up to the Whitman Value.





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ToughSonic® 14 Level & Distance Sensor

Specifications

Optimum Range	10 ft. (3 m)	Max Range	14 feet (4.3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Two selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; also affected by SenixVIEW filter selections		
Output Selection	Voltage & 4-20 mA current loop (defaults), switches, or a combination; see CONNECTIONS below		
Voltage Output	0-10, 0-5 VDC or PC customized, 10 mA max; also push-button teachable endpoints		
Current Loop	4-20 mA or PC customized, current sourcing, max. loop 450Ω, teachable endpoints		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600 to 115200 baud, 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, light, transparency or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 60 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output	White *	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output	Black *	4-20 mA or user adjusted end values between 4 and 20 mA
Switch #1 Output	Black *	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White *	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see part numbers)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see part numbers)

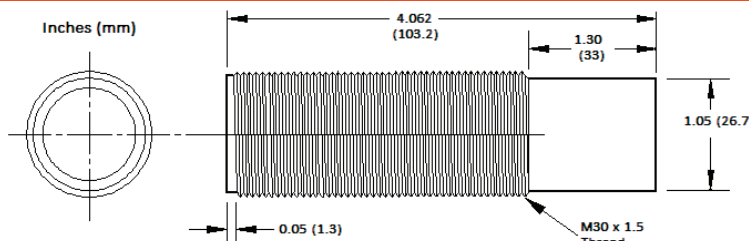
(*) Outputs on the black and white wires are SenixVIEW selected. The black wire options are 4-20 mA current loop or switch. White wire options are 0-10 VDC or switch. Switches can be sourcing or sinking. Max current loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
TSPC-30S1-232	Serial RS-232 interface (PC COM port compatible)
TSPC-30S1-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Dimensions



Mechanical

Dimensions are in inches (mm)
 Hole diameter: 1.2 in. (30.5 mm)
 Standard Cable: 6.5ft (2m)
 Ships with instructions and two 30mm stainless mounting nuts (other options available)
 Total Weight: 10.4 oz (0.29 kg)

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ToughSonic® 14 Level Sensor with NPT Threads

Specifications

Optimum Range	10 ft. (3 m)	Max Range	14 feet (4.3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Two selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Serial data: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; also affected by SenixVIEW filter selections		
Output Selection	Voltage & 4-20 mA current loop (defaults), switches, or a combination; see CONNECTIONS below		
Voltage Output	0-10, 0-5 VDC or PC customized, 10 mA max; also push-button teachable endpoints		
Current Loop	4-20 mA or PC customized, current sourcing, max. loop 450Ω, teachable endpoints		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600 to 115200 baud, 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, light, transparency or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 60 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output	White *	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output	Black *	4-20 mA or user adjusted end values between 4 and 20 mA
Switch #1 Output	Black *	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White *	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see part numbers)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see part numbers)

(*) Outputs on the black and white wires are SenixVIEW selected. The black wire options are 4-20 mA current loop or switch. White wire options are 0-10 VDC or switch. Switches can be sourcing or sinking. Max current loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included.

Part Numbers

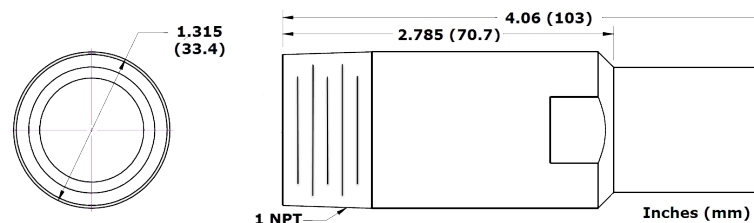
Model Number	Description
TSPC-N1S1-485	Analog, switch and RS-485 serial interface (allows addressable multi-sensor networks)
TSPC-N1S1-485A *	Same as above but with only RS-485 serial data interface *
TSPC-N1S1-232	Analog, switch and RS-232 serial data interface (PC COM port compatible)
TSPC-N1S1-232A *	Same as above but with only RS-232 serial data interface *

These products are also available with a 30 mm threaded body. See ToughSonic 14 data sheet.

* Models with "A" suffix are data communications only; Analog & switch outputs, pushbutton and interface LEDs are removed.

Senix also offers interconnection, communications, mounting and display accessories.

Dimensions



Mechanical

Dimensions are in inches (mm)

Standard Cable: 6.5ft (2m)

Ships with instructions

Total Weight: 14.2 oz (0.4 kg)



ToughSonic[®] 30 Level & Distance Sensor

Specifications

Optimum Range	20 ft. (6.1 m)	Max Range	30 ft. (9.1 m)
Deadband	Typ. < 10 in. (25.4 cm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Serial data: 0.0068 in. (0.172 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	10 Hz (100 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, transparency, light, or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 70 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min end values. The maximum loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included.

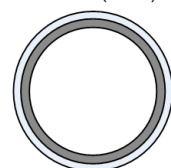
Part Numbers

Model Number	Description
TSPC-15S-485	Analog, switch and RS-485 serial interface (allows addressable multi-sensor networks)
TSPC-15S-485A *	Same as above but with only RS-485 serial data interface *
TSPC-15S-232	Analog, switch and RS-232 serial data interface (PC COM port compatible)
TSPC-15S-232A *	Same as above but with only RS-232 serial data interface *

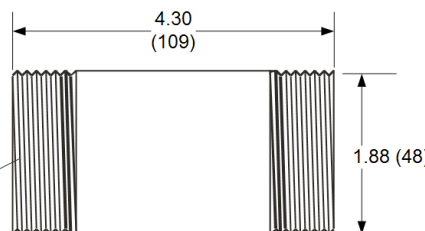
* Models with "A" suffix are data communications only; Analog & switch outputs, pushbutton and interface LEDs are removed.
Senix also offers interconnection, communications, mounting and display accessories.

Dimensions

Dimensions in
Inches (mm)



1.5 inch
NPT thread



Mechanical

Mounting: 1.5 inch NPT thread,
top or bottom

Attached Cable: 6.5ft (2 m)

Total Weight: 22.6 oz. (0.64 kg)



ToughSonic[®] CHEM 10 Level Sensor

Specifications

Optimum Range	80 in. (2 m)	Max Range	10 ft. (3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	SenixVIEW software
Case Material	PVDF	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Rugged piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Greater of +/-0.03 in. (0.76 mm) or 0.2% of target distance in stable environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Input Power	10-30 VDC, 50 mA maximum (not including output currents)		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
Target Requirements			
Target	Detects flat or irregular surfaces. Target surface must reflect sound back to sensor.		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Granular Solids	De-rate max range by 50%; range affected by material density and orientation		
Orientation	Orient sensor beam perpendicular to target surface for best performance		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC, 50 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min values. The maximum loop resistance is derated below 15 VDC input voltage.

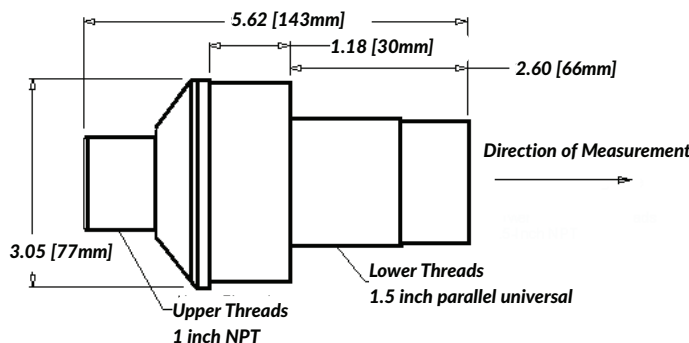
(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
LVL-100-232	Serial RS-232 interface (PC COM port compatible)
LVL-100-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Senix also offers interconnection, communication, mounting, and display components

Dimensions



Mechanical

Mounting Threads:

Lower 1-1/2-in. Parallel
Upper 1-in. NPT
(1 in. BSP tapered, or M32 x 1.5 metric by special order)

Attached Cable:

PUR jacket, 6.5ft (2 m) long

Weight:

21.2 oz. (0.60 kg)

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ToughSonic[®] CHEM 20 Level Sensor

Specifications

Optimum Range	13 ft. (4 m)	Max Range	20 feet (6.1 m)
Deadband	Typ. < 8 in. (20.3 cm)	Adjustment	SenixVIEW software
Case Material	PVDF	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Rugged piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0068 in. (0.172 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	10 Hz (100 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
Target Requirements			
Target	Detects flat or irregular surfaces. Target surface must reflect sound back to sensor.		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Granular Solids	De-rate max range by 50%; range affected by material density and orientation		
Orientation	Orient sensor beam perpendicular to target surface for best performance		
Optical	Unaffected by target color, light level, transparency, or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 50 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min values. The max. loop resistance is derated below 15 VDC input voltage.

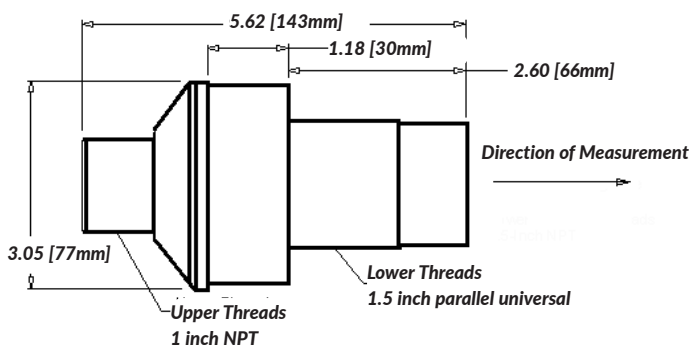
(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
LVL-300-232	Serial RS-232 interface (PC COM port compatible)
LVL-300-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Senix also offers interconnection, communication, mounting, and display components

Dimensions



Mechanical

Mounting Threads:

Lower 1-1/2-in. Parallel
Upper 1-in. NPT
(1 in. BSP tapered, or M32 x 1.5 metric by special order)

Attached Cable:

PUR jacket, 6.5ft (2 m) long

Weight: 21.78 oz. (0.62 kg)

Specifications subject to change without notice. This product is not recommended for applications with hazardous or explosive materials, or as a primary device for personal safety.



\$579.00 List



ToughSonic® 14 Level & Distance Sensor

Specifications

Optimum Range	10 ft. (3 m)	Max Range	14 feet (4.3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Two selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; also affected by SenixVIEW filter selections		
Output Selection	Voltage & 4-20 mA current loop (defaults), switches, or a combination; see CONNECTIONS below		
Voltage Output	0-10, 0-5 VDC or PC customized, 10 mA max; also push-button teachable endpoints		
Current Loop	4-20 mA or PC customized, current sourcing, max. loop 450Ω, teachable endpoints		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600 to 115200 baud, 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, light, transparency or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 60 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output	White *	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output	Black *	4-20 mA or user adjusted end values between 4 and 20 mA
Switch #1 Output	Black *	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White *	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see part numbers)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see part numbers)

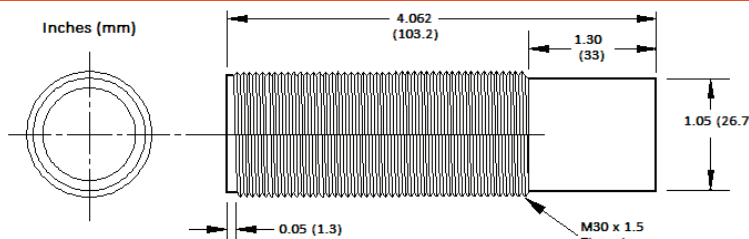
(*) Outputs on the black and white wires are SenixVIEW selected. The black wire options are 4-20 mA current loop or switch. White wire options are 0-10 VDC or switch. Switches can be sourcing or sinking. Max current loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
TSPC-30S1-232	Serial RS-232 interface (PC COM port compatible)
TSPC-30S1-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Dimensions



Mechanical

Dimensions are in inches (mm)
 Hole diameter: 1.2 in. (30.5 mm)
 Standard Cable: 6.5ft (2m)
 Ships with instructions and two 30mm stainless mounting nuts (other options available)
 Total Weight: 10.4 oz (0.29 kg)



\$579.00 List



ToughSonic[®] 14 Level Sensor with NPT Threads

Specifications

Optimum Range	10 ft. (3 m)	Max Range	14 feet (4.3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Two selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Serial data: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; also affected by SenixVIEW filter selections		
Output Selection	Voltage & 4-20 mA current loop (defaults), switches, or a combination; see CONNECTIONS below		
Voltage Output	0-10, 0-5 VDC or PC customized, 10 mA max; also push-button teachable endpoints		
Current Loop	4-20 mA or PC customized, current sourcing, max. loop 450Ω, teachable endpoints		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600 to 115200 baud, 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, light, transparency or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 60 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output	White *	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output	Black *	4-20 mA or user adjusted end values between 4 and 20 mA
Switch #1 Output	Black *	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White *	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see part numbers)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see part numbers)

(*) Outputs on the black and white wires are SenixVIEW selected. The black wire options are 4-20 mA current loop or switch. White wire options are 0-10 VDC or switch. Switches can be sourcing or sinking. Max current loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included.

Part Numbers

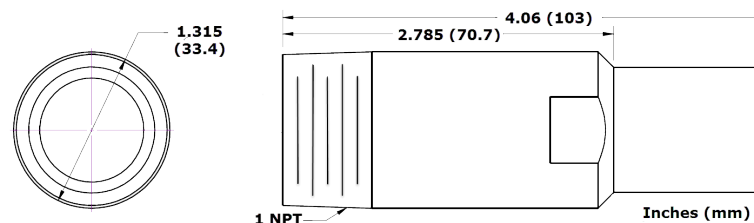
Model Number	Description
TSPC-N1S1-485	Analog, switch and RS-485 serial interface (allows addressable multi-sensor networks)
TSPC-N1S1-485A *	Same as above but with only RS-485 serial data interface *
TSPC-N1S1-232	Analog, switch and RS-232 serial data interface (PC COM port compatible)
TSPC-N1S1-232A *	Same as above but with only RS-232 serial data interface *

These products are also available with a 30 mm threaded body. See ToughSonic 14 data sheet.

* Models with "A" suffix are data communications only; Analog & switch outputs, pushbutton and interface LEDs are removed.

Senix also offers interconnection, communications, mounting and display accessories.

Dimensions



Mechanical

Dimensions are in inches (mm)

Standard Cable: 6.5ft (2m)

Ships with instructions

Total Weight: 14.2 oz (0.4 kg)



\$699.00 List



ToughSonic[®] 30 Level & Distance Sensor

Specifications

Optimum Range	20 ft. (6.1 m)	Max Range	30 ft. (9.1 m)
Deadband	Typ. < 10 in. (25.4 cm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Serial data: 0.0068 in. (0.172 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	10 Hz (100 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, transparency, light, or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 70 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min end values. The maximum loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included.

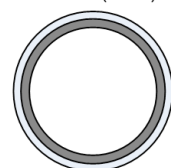
Part Numbers

Model Number	Description
TSPC-15S-485	Analog, switch and RS-485 serial interface (allows addressable multi-sensor networks)
TSPC-15S-485A *	Same as above but with only RS-485 serial data interface *
TSPC-15S-232	Analog, switch and RS-232 serial data interface (PC COM port compatible)
TSPC-15S-232A *	Same as above but with only RS-232 serial data interface *

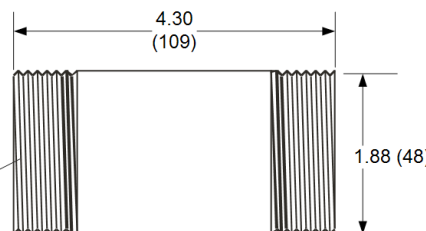
* Models with "A" suffix are data communications only; Analog & switch outputs, pushbutton and interface LEDs are removed.
Senix also offers interconnection, communications, mounting and display accessories.

Dimensions

Dimensions in
Inches (mm)



1.5 inch
NPT thread



Mechanical

Mounting: 1.5 inch NPT thread,
top or bottom

Attached Cable: 6.5ft (2 m)

Total Weight: 22.6 oz. (0.64 kg)

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\$709.00 List



ToughSonic[®] CHEM 10 Level Sensor

Specifications

Optimum Range	80 in. (2 m)	Max Range	10 ft. (3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	SenixVIEW software
Case Material	PVDF	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Rugged piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Greater of +/-0.03 in. (0.76 mm) or 0.2% of target distance in stable environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Input Power	10-30 VDC, 50 mA maximum (not including output currents)		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
Target Requirements			
Target	Detects flat or irregular surfaces. Target surface must reflect sound back to sensor.		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Granular Solids	De-rate max range by 50%; range affected by material density and orientation		
Orientation	Orient sensor beam perpendicular to target surface for best performance		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC, 50 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min values. The maximum loop resistance is derated below 15 VDC input voltage.

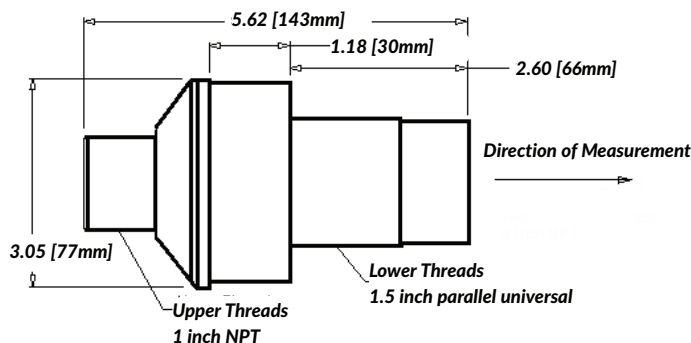
(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
LVL-100-232	Serial RS-232 interface (PC COM port compatible)
LVL-100-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Senix also offers interconnection, communication, mounting, and display components

Dimensions



Mechanical

Mounting Threads:

Lower 1-1/2-in. Parallel
Upper 1-in. NPT
(1 in. BSP tapered, or M32 x 1.5 metric by special order)

Attached Cable:

PUR jacket, 6.5ft (2 m) long

Weight:

21.2 oz. (0.60 kg)

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\$779.00 List



ToughSonic[®] CHEM 20 Level Sensor

Specifications

Optimum Range	13 ft. (4 m)	Max Range	20 feet (6.1 m)
Deadband	Typ. < 8 in. (20.3 cm)	Adjustment	SenixVIEW software
Case Material	PVDF	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Rugged piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0068 in. (0.172 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	10 Hz (100 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
Target Requirements			
Target	Detects flat or irregular surfaces. Target surface must reflect sound back to sensor.		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Granular Solids	De-rate max range by 50%; range affected by material density and orientation		
Orientation	Orient sensor beam perpendicular to target surface for best performance		
Optical	Unaffected by target color, light level, transparency, or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 50 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min values. The max. loop resistance is derated below 15 VDC input voltage.

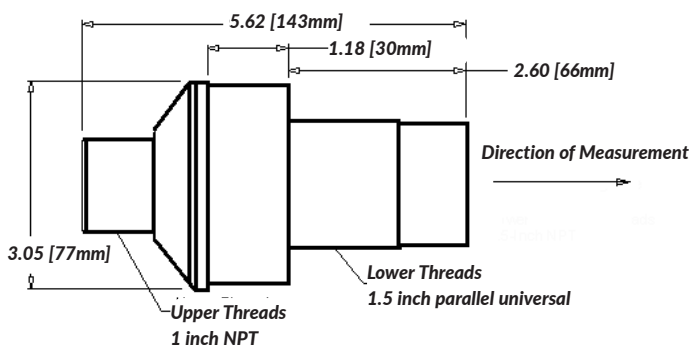
(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
LVL-300-232	Serial RS-232 interface (PC COM port compatible)
LVL-300-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Senix also offers interconnection, communication, mounting, and display components

Dimensions



Mechanical

Mounting Threads:

Lower 1-1/2-in. Parallel
Upper 1-in. NPT
(1 in. BSP tapered, or M32 x 1.5 metric by special order)

Attached Cable:

PUR jacket, 6.5ft (2 m) long

Weight: 21.78 oz. (0.62 kg)

Specifications subject to change without notice. This product is not recommended for applications with hazardous or explosive materials, or as a primary device for personal safety.



2020 Level Sensor Options for All Above

12/6/2019

- RS 485 Configuration Kit #1 with Power Supply, Data Cable and
Preloaded Software on Board \$99.00 List
- RS 485 Configuration Kit #2 Is Above Plus
Isolated USB and DIN Mount Converters \$199.00 List

For other options, consult factory.



\$579.00 List



ToughSonic[®] 14 Level & Distance Sensor

Specifications

Optimum Range	10 ft. (3 m)	Max Range	14 feet (4.3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Two selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; also affected by SenixVIEW filter selections		
Output Selection	Voltage & 4-20 mA current loop (defaults), switches, or a combination; see CONNECTIONS below		
Voltage Output	0-10, 0-5 VDC or PC customized, 10 mA max; also push-button teachable endpoints		
Current Loop	4-20 mA or PC customized, current sourcing, max. loop 450Ω, teachable endpoints		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600 to 115200 baud, 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, light, transparency or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 60 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output	White *	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output	Black *	4-20 mA or user adjusted end values between 4 and 20 mA
Switch #1 Output	Black *	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White *	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see part numbers)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see part numbers)

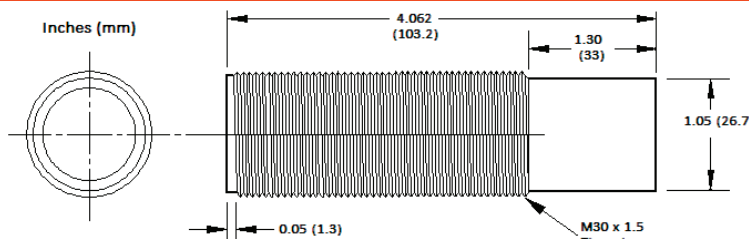
(*) Outputs on the black and white wires are SenixVIEW selected. The black wire options are 4-20 mA current loop or switch. White wire options are 0-10 VDC or switch. Switches can be sourcing or sinking. Max current loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
TSPC-30S1-232	Serial RS-232 interface (PC COM port compatible)
TSPC-30S1-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Dimensions



Mechanical

Dimensions are in inches (mm)
 Hole diameter: 1.2 in. (30.5 mm)
 Standard Cable: 6.5ft (2m)
 Ships with instructions and two 30mm stainless mounting nuts (other options available)
 Total Weight: 10.4 oz (0.29 kg)



ToughSonic 14 Continued

Phone: (800) 233-4401

www.whitmancontrols.com e-mail: sales@whitmancontrols.com

ToughSonic[®] 14 Level Sensor with NPT Threads

Specifications

Optimum Range	10 ft. (3 m)	Max Range	14 feet (4.3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Two selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Serial data: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; also affected by SenixVIEW filter selections		
Output Selection	Voltage & 4-20 mA current loop (defaults), switches, or a combination; see CONNECTIONS below		
Voltage Output	0-10, 0-5 VDC or PC customized, 10 mA max; also push-button teachable endpoints		
Current Loop	4-20 mA or PC customized, current sourcing, max. loop 450Ω, teachable endpoints		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600 to 115200 baud, 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, light, transparency or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 60 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output	White *	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output	Black *	4-20 mA or user adjusted end values between 4 and 20 mA
Switch #1 Output	Black *	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White *	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see part numbers)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see part numbers)

(*) Outputs on the black and white wires are SenixVIEW selected. The black wire options are 4-20 mA current loop or switch. White wire options are 0-10 VDC or switch. Switches can be sourcing or sinking. Max current loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included.

Part Numbers

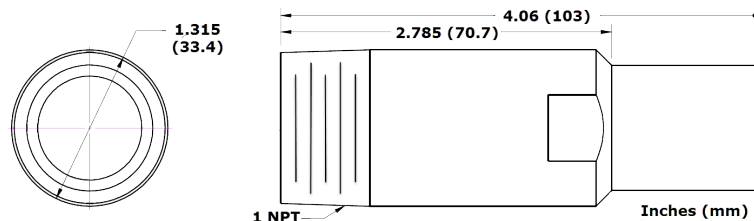
Model Number	Description
TSPC-N1S1-485	Analog, switch and RS-485 serial interface (allows addressable multi-sensor networks)
TSPC-N1S1-485A *	Same as above but with only RS-485 serial data interface *
TSPC-N1S1-232	Analog, switch and RS-232 serial data interface (PC COM port compatible)
TSPC-N1S1-232A *	Same as above but with only RS-232 serial data interface *

These products are also available with a 30 mm threaded body. See ToughSonic 14 data sheet.

* Models with "A" suffix are data communications only; Analog & switch outputs, pushbutton and interface LEDs are removed.

Senix also offers interconnection, communications, mounting and display accessories.

Dimensions



Mechanical

Dimensions are in inches (mm)
 Standard Cable: 6.5ft (2m)
 Ships with instructions
 Total Weight: 14.2 oz (0.4 kg)



\$699.00 List

Phone: (800) 233-4401

www.whitmancontrols.com e-mail: sales@whitmancontrols.com

ToughSonic® 30 Level & Distance Sensor

Specifications

Optimum Range	20 ft. (6.1 m)	Max Range	30 ft. (9.1 m)
Deadband	Typ. < 10 in. (25.4 cm)	Adjustment	Button "teach" or SenixVIEW
Case Material	316 stainless steel	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Ruggedized piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Serial data: 0.0068 in. (0.172 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	10 Hz (100 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
SYNC feature	Permits up to 32 sensors to operate in close proximity without interaction		
Target Requirements			
Objects	Detects flat or curved objects. Surface must reflect ultrasound to sensor		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Orientation	Flat surfaces should be oriented perpendicular to sensor output beam		
Optical	Unaffected by target color, transparency, light, or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 70 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min end values. The maximum loop resistance is derated below 15 VDC input voltage.

(**) At default update rate. Output currents not included.

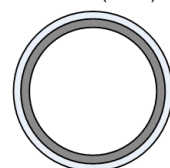
Part Numbers

Model Number	Description
TSPC-15S-485	Analog, switch and RS-485 serial interface (allows addressable multi-sensor networks)
TSPC-15S-485A *	Same as above but with only RS-485 serial data interface *
TSPC-15S-232	Analog, switch and RS-232 serial data interface (PC COM port compatible)
TSPC-15S-232A *	Same as above but with only RS-232 serial data interface *

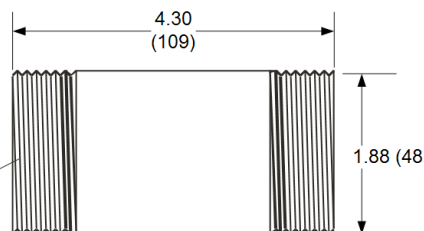
* Models with "A" suffix are data communications only; Analog & switch outputs, pushbutton and interface LEDs are removed. Senix also offers interconnection, communications, mounting and display accessories.

Dimensions

Dimensions in Inches (mm)



1.5 inch NPT thread



Mechanical

Mounting: 1.5 inch NPT thread, top or bottom

Attached Cable: 6.5ft (2 m)

Total Weight: 22.6 oz. (0.64 kg)



ToughSonic[®] CHEM 10 Level Sensor

Specifications

Optimum Range	80 in. (2 m)	Max Range	10 ft. (3 m)
Deadband	Typ. < 4 in. (100 mm)	Adjustment	SenixVIEW software
Case Material	PVDF	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Rugged piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0034 in. (0.086 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Greater of +/-0.03 in. (0.76 mm) or 0.2% of target distance in stable environment		
Update Rate	20 Hz (50 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Input Power	10-30 VDC, 50 mA maximum (not including output currents)		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
Target Requirements			
Target	Detects flat or irregular surfaces. Target surface must reflect sound back to sensor.		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Granular Solids	De-rate max range by 50%; range affected by material density and orientation		
Orientation	Orient sensor beam perpendicular to target surface for best performance		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC, 50 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min values. The maximum loop resistance is derated below 15 VDC input voltage.

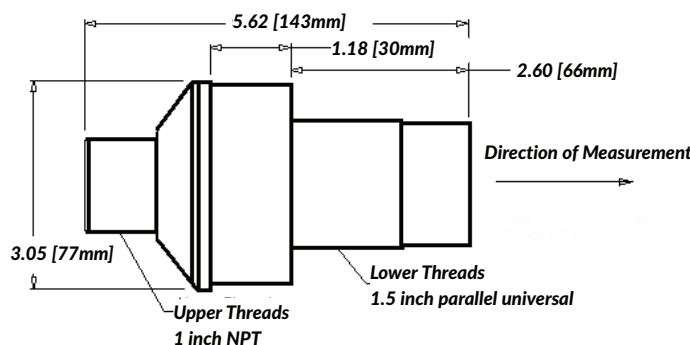
(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
LVL-100-232	Serial RS-232 interface (PC COM port compatible)
LVL-100-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Senix also offers interconnection, communication, mounting, and display components

Dimensions



Mechanical

Mounting Threads:

Lower 1-1/2-in. Parallel
Upper 1-in. NPT
(1 in. BSP tapered, or M32 x 1.5 metric by special order)

Attached Cable:

PUR jacket, 6.5ft (2 m) long

Weight:

21.2 oz. (0.60 kg)



\$779.00 List

ToughSonic[®] CHEM 20 Level Sensor

Specifications

Optimum Range	13 ft. (4 m)	Max Range	20 feet (6.1 m)
Deadband	Typ. < 8 in. (20.3 cm)	Adjustment	SenixVIEW software
Case Material	PVDF	Configuration	Stored in non-volatile memory
Temperature	-40 to 158 F (-40 to 70 C)	Outputs	Five selectable, plus serial data
Humidity	0 to 100% operating	Transducer	Rugged piezoelectric
Compensation	Temperature compensated	Protection	NEMA-4X, NEMA-6P, IP68
Resolution	Digital: 0.0068 in. (0.172 mm); Analog: 4099 steps (0-10 VDC), 3279 steps (4-20 mA)		
Repeatability	Nominal 0.2% of range @ constant temp. Affected by target, distance, environment		
Update Rate	10 Hz (100 ms), SenixVIEW adjustable; affected by SenixVIEW filter selections		
Voltage Output	0-10, 0-5 VDC or PC customized; 10 mA max. (*)		
Current Loop #1	Current sourcing 4-20 mA or PC customized, max. loop 450Ω (*)		
Current Loop #2	Current sinking 4-20 mA or PC customized, max. loop 450Ω (*)		
Sinking Switch	150 mA max. @ 40 VDC max., teachable set point & polarity, fault indication		
Sourcing Switch	150 mA max. @ input voltage, teachable set point & polarity, fault indication		
RS-232, RS-485	Modbus protocol, 9600-115200 baud (selectable), 8 data bits, 1 stop, no parity		
Target Requirements			
Target	Detects flat or irregular surfaces. Target surface must reflect sound back to sensor.		
Max. Distance	Affected by size, shape, orientation of target (sound level reflected back to sensor), environment Restrict use to Optimum Range when using over a wide range of environmental conditions		
Granular Solids	De-rate max range by 50%; range affected by material density and orientation		
Orientation	Orient sensor beam perpendicular to target surface for best performance		
Optical	Unaffected by target color, light level, transparency, or other optical characteristics		

Connections

Cable Connection	Wire	Description
Power	Brown	10-30 VDC @ 50 mA maximum; Typical: 45 mA @ 24 VDC (**)
Ground	Blue	Power and interface common
Voltage Output *	Violet	0-10 VDC, 0-5 VDC or custom end values between 0 and 10 VDC
Current Loop Output *	Green	4-20 mA sourcing (adjustable end values between 4 and 20 mA)
Current Loop Output *	Orange	4-20 mA sinking (adjustable end values between 4 and 20 mA)
Switch #1 Output	Black	Sinking ("NPN") or Sourcing ("PNP"), user selected
Switch #2 Output	White	Sinking ("NPN") or Sourcing ("PNP"), user selected
RS-232 out / RS-485-	Gray	Serial data connection (depends on model - see model selection)
RS-232 in / RS-485+	Yellow	Serial data connection (depends on model - see model selection)

(*) Analog outputs share common distance endpoints. Both 4-20 mA outputs share the same adjustable max / min values. The max. loop resistance is derated below 15 VDC input voltage.

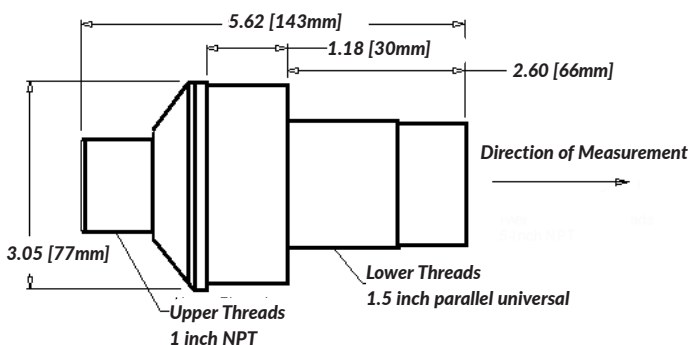
(**) At default update rate. Output currents not included. Sensitivity reduced below 15 VDC input voltage.

Part Numbers

Model Number	Description
LVL-300-232	Serial RS-232 interface (PC COM port compatible)
LVL-300-485	Serial RS-485 interface (allows addressable multi-sensor networks)

Senix also offers interconnection, communication, mounting, and display components

Dimensions



Mechanical

Mounting Threads:

Lower 1-1/2-in. Parallel
Upper 1-in. NPT
(1 in. BSP tapered, or M32 x 1.5 metric by special order)

Attached Cable:

PUR jacket, 6.5ft (2 m) long

Weight: 21.78 oz. (0.62 kg)

Specifications subject to change without notice. This product is not recommended for applications with hazardous or explosive materials, or as a primary device for personal safety.



WHITMAN CONTROLS, LLC
201 DOLPHIN ROAD, BRISTOL, CT 06010-8000
(860) 583-1847 info@whitmancontrols.com FAX (860) 583-5293

2020 Level Sensor Options for All Above

12/6/2019

RS 485 Configuration Kit #1 with Power Supply, Data Cable and
Preloaded Software on Board \$99.00 List

RS 485 Configuration Kit #2 Is Above Plus
Isolated USB and DIN Mount Converters \$199.00 List

For other options, consult factory.



ToughSonic® CHEM Series

Ultrasonic Level Sensors

- *PC Configurable*
- *Chemically Resistant*
- *Multiple Outputs or Serial Only*
- *Attached Cable*
- *Dual Threads*



ToughSonic CHEM 10

ToughSonic CHEM 20

ToughSonic CHEM 35

Installation and Operating Instructions

Product Declarations

Document Revisions

Initial release	31 May 2015
Updated for new models	5 Sep 2019

Related Products

WhitmanVIEW for Windows

A setup tool for TSPC and CHEM series sensors, this software installs on a PC and is used to configure sensor options, select and calibrate outputs, view and analyze measurements, and save the result to a PC hard drive. Recalled configurations can restore or duplicate an application without recalibration. View, chart, log, and analyze sensor operation. Sensor firmware upgrades can be done easily through WhitmanVIEW too. Download WhitmanVIEW at no charge from: <http://WhitmanControls.com/WhitmanVIEW-ultrasonic-sensor-software/>.

Setup Kits

Used for bench viewing or configuring sensors, kits include power supply, terminal board and cables to interconnect with your PC. A WhitmanVIEW thumb drive with software, videos and manuals is also included (see Software and Interconnection, page 11).

CE Compliance

ToughSonic® family of ultrasonic sensors are compliant with the CE Electromagnetic Compatibility Directives and Standards listed below:
Directives: Electromagnetic Compatibility (2004/108/EC)
Low-Voltage (2006/95/EC) Standards: EMC: EN 61326-1:2006 Industrial Safety: EN 61010-1:2001

Warranty

Whitman Controls makes no warranty, representation, or guarantee regarding the suitability of the products for any particular purpose. All specifications are subject to change without notice.

Whitman Controls, Inc. will repair or replace, at our option, any part found by us to be defective in material or workmanship if the product is received by Whitman Controls, freight prepaid, within one year from the date of original shipment to buyer.

Disclaimer and Release. The warranties, obligations and liabilities of Whitman Controls and the remedies of buyer set forth above are exclusive and in substitution for, and buyer hereby waives, releases and renounces all other warranties, obligations and liabilities of Whitman Controls and all other rights, claim, and remedies of buyer against Whitman Controls, expressed or implied, arising by law or otherwise, including but not limited to: (A) Any implied warranty or merchantability or fitness; (B) Any implied warranty arising from course of performance, course of dealing or usage of trade; (C) Any obligation, liability, right, claim or remedy in tort, whether or not arising from the negligence of Whitman Controls (whether active, passive or imputed); and (D) Any obligation, liability, right, claim or remedy for loss or damage to any product.

Exclusion of Consequential and Other Damages. Whitman Controls shall have no obligation or liability, whether arising in contract (including warranty), tort (including active, passive or imputed negligence) or otherwise, for loss of use, revenue or profit with respect to any nonconformance or defect in any product delivered under this agreement, or for any other direct, incidental or consequential damages.

Governing Law. The terms and conditions of this agreement shall be governed by the domestic law of the State of Vermont, U.S.A.

Repairs and Returns

Any returns must have a Return Material Authorization (RMA) number. Contact us at:
Mail: Whitman Controls, LLC
201 Dolphin Rd
Bristol, CT 06010 USA
Web: <http://Whitmancontrols.com/>

TABLE OF CONTENTS

PRODUCT DECLARATIONS	2
Document Revisions	2
Related Products	2
CE Compliance	2
Warranty	2
Repairs and Returns	2
ULTRASONICS OVERVIEW	4
Introduction	4
Advantages	4
Other Applications	4
Terminology	5
SENSOR OVERVIEW.....	6
CHEM Product Features	6
Specifications	7
Startup Tips	9
Mechanical Details	10
Installation	10
INTERFACES	12
Wiring	12
Analog Outputs	13
Switch Outputs	15
Serial Data Interface	18
Serial Parameters	19
Serial Data Protocols	20
OPERATION	21
Power Up	21
Measurement Activation	21
Synchronization	22
Operating Range	22
Measurement Process	23
Sensor Viewing	24
Measurement Rate	26
Output Response Time	26
Filters	27
Time Delays	30
Temperature Compensation	30
WHITMANVIEW SOFTWARE	31
Install WhitmanVIEW	31
Application Setups	31
Connect a Sensor	32
Outputs	33
Sensor Adjustment	35

LIST OF FIGURES

Figure 1 - Part Number Structure.....	6
Figure 2 – Housing Dimensions.....	10
Figure 3 - Sensor Orientation	10
Figure 4 – Flange Mounting.....	11
Figure 5 - Nipple Mounting.....	11
Figure 6 - RS-232 PC COM Port Connections.....	12
Figure 7 - Voltage Output Wiring	13
Figure 8 - Sourcing Current Loop Wiring.....	13
Figure 9 - Sinking Current Loop Wiring	13
Figure 10 - WhitmanVIEW Analog Adjustments.....	14
Figure 11 - Sinking Switch Output Wiring	15
Figure 12 - Sourcing Switch Output Wiring.....	15
Figure 13 - Switch Hysteresis & Window Modes.....	16
Figure 14 - WhitmanVIEW Switch Adjustment	17
Figure 15 - RS-232 PC COM Port Connections.....	18
Figure 16 - LVL-xxxx-232 Connections.....	18
Figure 17 - LVL-xxxx-485 Connections.....	18
Figure 18 - RS-485 Network Wiring	18
Figure 19 - Measurement Activation Selections	21
Figure 20 - WhitmanVIEW Polling Controls	22
Figure 21 - Measurement Process Diagram.....	23
Figure 22 - WhitmanVIEW Distance Displays	24
Figure 23 - Filters Block Diagram.....	27

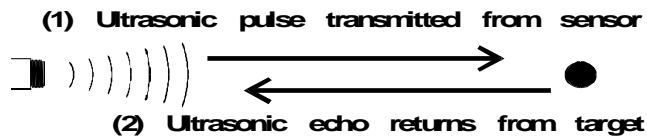
LIST OF TABLES

Table 1 - Specifications	8
Table 2 - Wire Assignments	12
Table 3 - Measurement Activation Summary	21
Table 4 - Maximum Range vs. Measure Rate	26
Table 5 - Filter Response Time	29

Ultrasonics Overview

Introduction

Whitman Controls sensors measure the distance to a liquid or solid surface by sending a sound wave, above the range of hearing, at the target surface and measuring the time for the sound echo to return. Knowing the speed of sound, the sensor determines the distance of the target, and inversely the level.

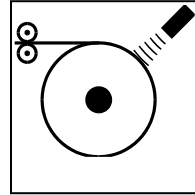


Advantages

- **Non-contact**
Measures through the air without touching the target material.
- **Easy to Install**
Threaded mounting from above means simple installation without entering the tank.
- **Point Level Outputs**
Solid state switch outputs provide control or alarm features that are user selectable.
- **Distance Proportional Outputs**
Three proportional analog outputs provide standard interfaces to PLCs or displays.
- **Unaffected by Target's Optical Characteristics**
Sensor operation is not sensitive to ambient light levels, the color of the target, or whether the target is optically transparent or reflective.
- **Remote Adjustment**
WhitmanVIEW software allows remote monitoring and adjustment for convenience and safety.

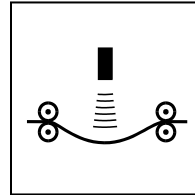
Other Applications

In addition to level control our ultrasonic sensors can be used in many other applications such as:



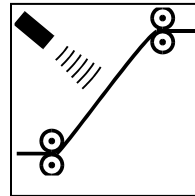
Roll Diameter

Measure the size of a roll to control tension or speed, or determine when full or empty.



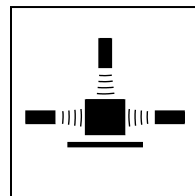
Loop Control

Precisely control the position of material loops, including wires, tubes and webs.



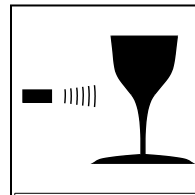
Web Break

Rapidly detect a broken web in a printing press or paper machine.



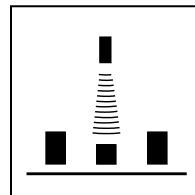
Dimensioning

Determine the size of an object for information or to determine its volume or width.



Proximity

Determine the presence of objects to count or control their movement.



Sort/Select

Sort or select objects based on differences in their physical dimensionsand many more...

Terminology

Terms listed here are shown in *italics* throughout this document. An asterisk (*) indicates a WhitmanVIEW configurable parameter.

Analog An electrical output type that varies in proportion to measured distance. Analog output types can be either *current loop* or *voltage*.

Analog Window* A range of distances between two *endpoints*, within which the analog output will vary between the analog high and low limits in proportion to measured distance.

Current High Value* The maximum (highest) value of both current loop outputs, typically 20 mA but adjustable using WhitmanVIEW.

Current Loop Output* An *analog* output type that drives an electrical current proportional to measured distance. CHEM sensors provide two standard 4-20 mA (sourcing and sinking) or WhitmanVIEW customized output ranges.

Current Low Value* The minimum (lowest) value of both current loop outputs, typically 4 mA but adjustable using WhitmanVIEW.

Deadband The small distance near the sensor face within which distance cannot be measured.

Endpoint* One of two end distances representing the outer limits of the *analog window*.

Hysteresis* The reverse distance a target must change to turn a switch OFF after the switch has turned ON at a *Setpoint*.

Ingress Rating An enclosure rating that identifies how susceptible a product is to the entry (ingress) of external objects or liquids.

Measurement Rate* The repetitive rate that the sensor measures distance (see *response time*).

Measurement Interval* The time between measurements, or $[1 / \textit{Measurement Rate}]$.

Measurement Process* The measurement, filtering and time delays that affect sensor outputs (p 23).

Maximum Range The maximum target detection distance of a sensor model; may be overridden by *Range MAX* (p 22).

Operating Range* The range of distances between the *range MIN* and *range MAX* values (p 22).

Optimum Range The range of target distances recommended for optimum performance in varying environmental conditions.

Range MAX* The farthest distance of the Operating Range; user adjustable in WhitmanVIEW.

Range MIN* The nearest distance of the Operating Range; user adjustable in WhitmanVIEW.

RS-232* An electrical interface standard used to transfer information using *serial data* communications. This is a single ended interface with a specified maximum range of 50 feet (15 meters) that typically supports one device.

RS-485* An electrical interface standard used to transfer

information using *serial data* communications. This is a long distance differential interface capable of supporting multiple addressable devices.

Response Time* The time required for sensor outputs to respond to measurements; affected by *measurement rate* and filter selections.

Serial Data A method of transferring information using a sequential (serial) on/off pattern to encode the data. Two common industry standards are *RS-232* and *RS-485*.

Setpoint* The distance a *switch* output turns ON.

Sinking Current Loop* (vs. sourcing current loop)
Analog 4-20 mA output where the current source is external and the sensor sinks that current loop to ground.

Sinking Switch* (vs. Sourcing Switch) One that sinks current from an external load to ground when turned ON. An ON sinking switch output measures a low voltage.

WhitmanVIEW Whitman Controls PC-based software used to configure and ToughSonic® sensors.

Sourcing Current Loop* (vs. sinking current loop)
Analog 4-20 mA output where the sensor is the source of current that flows out of the sensor.

Sourcing Switch* (vs. Sinking Switch) One that sources current from the sensor to the load when turned ON. An ON sourcing switch output measures a high voltage.

Switch* An electrical output type that is either ON or OFF. ToughSonic® switches are solid state and can be either sinking or sourcing type.

SYNC* A wired configuration that synchronizes the timing of two or more sensors to prevent crosstalk or ensure simultaneous measurements. This feature is generally not used in level measurement applications.

Target Any object or material that reflects *ultrasonic* energy back to the sensor thus allowing the sensor to measure its distance.

Time Delay* A time period triggered by a set of conditions and, after those conditions persist for the entire period, cause a secondary event to occur. There are several user-selected time delay features available.

Ultrasonic A sound wave of a frequency greater than 20,000 Hz, typically above the range of human hearing.

Voltage High Value* The maximum (highest) value of the voltage outputs, typically 10 VDC but adjustable using WhitmanVIEW.

Voltage Low Value* The minimum (lowest) value of the voltage output, typically 0 VDC but adjustable using WhitmanVIEW.

Voltage Output* An *analog* output type that drives an electrical voltage proportional to measured distance. CHEM series sensors provide industry standard or WhitmanVIEW customized output ranges.

Sensor Overview

CHEM Product Features

ToughSonic® CHEM sensors measure distance without contact and are designed for tough industrial environments.

Rapid PC Setup & Control



PC setup gives you control over all sensor outputs and features. View, analyze and save sensor setups for rapid implementation or cloning.

Chemically Resistant Packaging

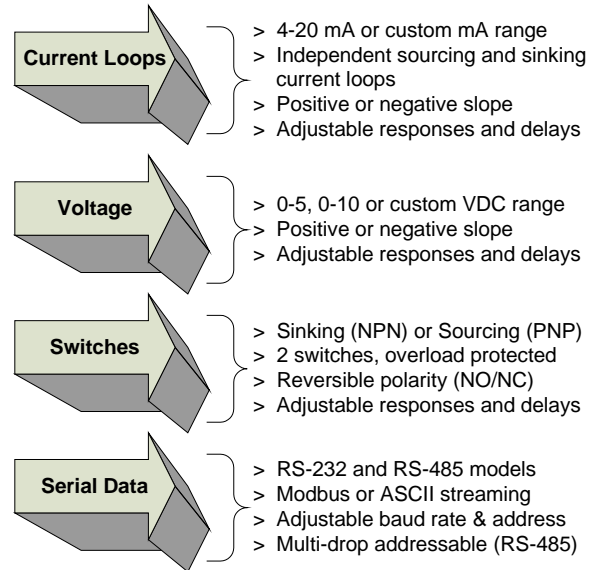
Rugged Kynar® PVDF housings are completely sealed and impervious to most chemicals and operate over a wide temperature range. A PUR jacketed interface cable is potted into each housing.



KYNAR® is a registered trademark of Arkema Inc. For chemical resistance information refer to www.arkemainc.com/kynar/literature/pdf/754.pdf.

Industry Standard Interfaces

Serial-only or multiple simultaneous outputs, each with many WhitmanVIEW adjustable features.



CHEM Series Part Numbers

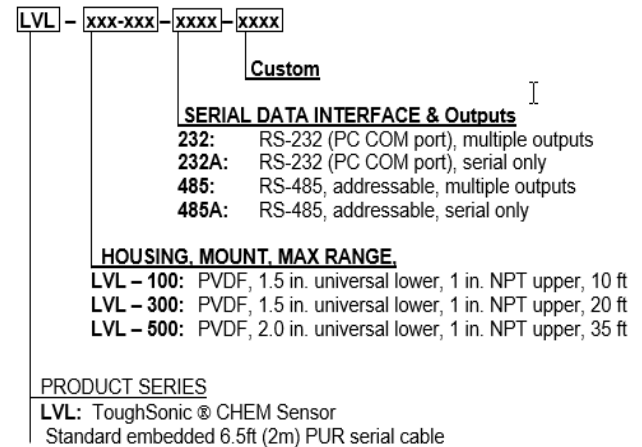





Figure 1 - Part Number Structure

Identification

The ToughSonic® model number and serial number are printed on the label on the side of the housing.

Specifications

A summary of sensor specifications is shown in the following table.

	ToughSonic CHEM 10	ToughSonic CHEM 20	ToughSonic CHEM 35
Photo			
Maximum Range Deadband (minimum)	10 ft. (3.1 m) 4 in. (10 cm)	20 ft. (6.1 m) 8 in. (20.3 cm)	35 ft. (10.7 m) 12 in. (31 cm)
Optimum Range (small targets, dry materials, hot)	80 in. (203 cm)	13 ft. (4.1 m)	25 ft. (7.6 m)
Resolution (<i>serial data</i>)	0.003384 in. (0.086 mm)	0.006768 in. (0.1719 mm)	0.013536 in. (0.3438 mm)
<i>Default:</i> RangeMIN RangeMAX Switch #1 Setpoint Switch #2 Setpoint Analog Low Endpoint Analog High Endpoint	4.0 in. (10.2 cm) 10 ft. (3.1 m) 80 in. (203 cm) 8 in. (20.3 cm) 80 in. (203 cm) 4.0 in. (10.2 cm)	8 in. (20.3 cm) 20 ft. (6.1 m) 160 in. (406 cm) 18 in. (45.7 cm) 160 in. (406 cm) 8 in. (20.3 cm)	12 in. (31.5 cm) 35 ft. (10.7 m) 280 in. (711 cm) 18 in. (45.7 cm) 280 in. (711 cm) 12 in. (30.5 cm)
Performance	Repeatability: Greater of +/-0.03 in. (0.76 mm) or 0.1% of target distance in stable environment Accuracy: Better than 0.5% of target distance in stable, homogeneous environment; affected by temperature gradients, target echo strength, speed of sound in vapors.		
Resolution (<i>analog</i>)	4100 steps 0-10 VDC and 3279 steps 4-20 mA (scaled between user-set distance endpoints)		
Measurement Interval	Default 50 msec (20 Hz)	Default 100 msec (10 Hz)	Default 200 msec (5 Hz)
	Adjustable from 5 mS to 2.8 hours; affected by filter selections; faster rates limit max target distance		
Outputs, full-featured models	Two switches: 150 mA, WhitmanVIEW configured as PNP (@ input voltage) or NPN (external 40 VDC max.), setpoint mode or window mode		
	One voltage: 0-10 vdc or WhitmanVIEW configured, 10 mA max (min 15 VDC input for full 10 VDC output)		
	Two current loops: one sourcing and one sinking loop, 4-20 mA or WhitmanVIEW configured, 450Ω max @ >15VDC, 250Ω max @ 10 VDC		
Serial Output, all models	RS-232 or RS-485 Modbus RTU by model, or ASCII stream		
Serial interface, Interface protocol	Modbus slave, ASCII, or SYNCH. RS-232 or RS-485 interface, depends on model. RS-485 models are 2-wire multi-drop addressable (addresses 1-247). Baud rates 9600 - 115200, none or even parity, 8 bits, one stop bit. WhitmanVIEW configured.		
Indicators	None		

ToughSonic® CHEM Family Sensors – Installation & Operating Instructions

Construction	Chemically resistant Kynar PVDF housing, threaded both ends, potted-in 4 or 9-conductor shielded PUR cable with tinned ends, 6.5 ft. (2 m)		
Transducer Beam	Rugged piezoelectric, nominal beam width 12 degrees @ -3 db, approx. conical shaped pattern		
Transducer Frequency	125 kHz	75 kHz	50 kHz
Cable, full outputs	6.5-ft (2m) 9-wire with shield, tinned ends, PUR		
Cable, serial-only	6.5-ft (2m) 4-wire with shield, tinned ends, PUR		
Max. cable length	RS-232: 50ft (15 m), RS-485: 3937ft (1200m)		
Power Input	10-30 VDC @ 55 mA max		
DC Current @ typical 24VDC input + I/O	45 mA typical. Add 20 mA if using sourcing current loop. Add switch loads if using sourcing switch(es).		
DC Current, Serial Only @ 24VDC input	29.3 mA (rev DA)	35.2 mA (rev DA)	35.9 mA (rev DA)
Environmental	Ingress: IP-68, NEMA-4X Humidity: 0-100% (avoid heavy condensation) Temp: -40 to +70 C operate		
Dimensions (Dia x Length)	3.05 (77mm) x 5.62 (143mm), 1.18 (30mm) inserted length		
Weight	19.8 oz. 0.56 kg.	20.7 oz. 0.59 kg.	28.0 oz. 0.79 kg.
Ordering	Refer to Figure 1, Part Numbers		

Table 1 - Specifications

Startup Tips

New or first-time users can use this condensed guide for assembly, connection to a PC, and basic sensor changes from default values before installation.

The sensor communicates with a Windows PC through the serial port or USB port. A UAN-Kit from Whitman Controls is recommended for connecting to your PC. It includes software, a termination board, and cables (see page 11).

▪ Install the Software

Put the WhitmanVIEW thumb drive into your PC. Open the contents and run WhitmanVIEW Version 3.4.xxx Setup.exe to install. Start WhitmanVIEW.

▪ Connect the Components

The sensor uses colored wires for power, communication, and outputs. For a basic terminal board connection, we'll use 4 of the sensor's wires:

- a. Brown for DC power (DC+)
- b. Blue for ground (GND and digital reference)
- c. Gray and Yellow for digital communication.

Connect them to the labeled Whitman Controls terminal board. Protect all bare wires from contacting one another whether connected or not. Ensure the terminal grips the stripped wire, not its colored jacket.

Plug the data communication cable into the terminal board RJ jack and your serial port (-232 models), or into the USB adapter (optional for -232 and required for -485 models). (For USB adapters see page 11)

Put the DC power supply cable into the jack on the terminal board, and the supply into an AC source. All sensors will faintly tick when powered.

▪ Connect to Your Sensor (using serial port)

1. Start WhitmanVIEW.
2. Menu bar: Sensor > Connect for a dialog box. All new sensors have network address 1. Use Baud rate 9600. The serial port is generally identified COM 1. Click *Connect*.

▪ OR Connect to Your Sensor (using a USB port)

1. Start WhitmanVIEW.
2. Menu bar: Sensor > Connect for a dialog box. All new sensors have network address 1. Use Baud rate 9600. Select the COM port from the choices or run Com Port Survey. If COM port is higher than the 12 shown. Edit > User Preferences... > Connection/ Starting COM port: and enter new start number. Return to

Connect Sensor and repeat connection with any available green ports. For more detail, see "Connect a Sensor", page 32.

▪ WhitmanVIEW Quick Tour

Once a sensor is connected, it can be viewed in the SENSOR view. Any changes are done in the WORKSPACE view and transferred to the sensor.

Basic layout of the main screen:

- a. Range and basic setup values, all editable.
- b. Workspace and Sensor views
- c. File saving and retrieval button
- d. Dialog screens for additional setup
- e. Analysis tools
- f. Output setup and simulated meters (editable)

Setup Basics (advanced description starts page 21)

When sensor is found, answer YES to copy sensor setup to the Workspace. You are left in Sensor View showing the sensor reading and its current setup.

To make changes, click the WORKSPACE button.

-To change a Range, Endpoint, or output value, just click on the value and enter a new one.

-To reverse the analog slope, right-click the High- or Low-value endpoint.

-To assign outputs, click WIRING and assign black and white wires as needed. Any changes in Workspace make it different than the Sensor, shown by the unequal symbol. Transfer WORKSPACE to SENSOR.

▪ Save the Setup to the Sensor

To move changes to sensor, right click and drag WORKSPACE to SENSOR. Any changes not sent to the sensor will be lost when closing WhitmanVIEW.

▪ Save the Setup to the PC.

Right click WORKSPACE and drag it to FILE.

▪ Mounting Tips

Sensor must be mounted perpendicular to the object to be measured for sound echoes to return. The sensor cannot sense in a space less than the default Minimum Range value. The sensor will ignore targets or surfaces beyond the Max Range value. Avoid echoes from pipe fittings, welds, and fixed objects with careful placement. The sensor will return a distance value from the first surface found within range. Contact Whitman Controls technical support for setup assistance.

Mechanical Details

Dimensions are inches [mm]. Sensor measurements are the distance between the ultrasonic transducer face (the bottom of housing shown below) and the target material. The lower threads vary by model:

- 1.5-in Parallel: LVL-100 and LVL-300
- 2.0-in Parallel: LVL-500

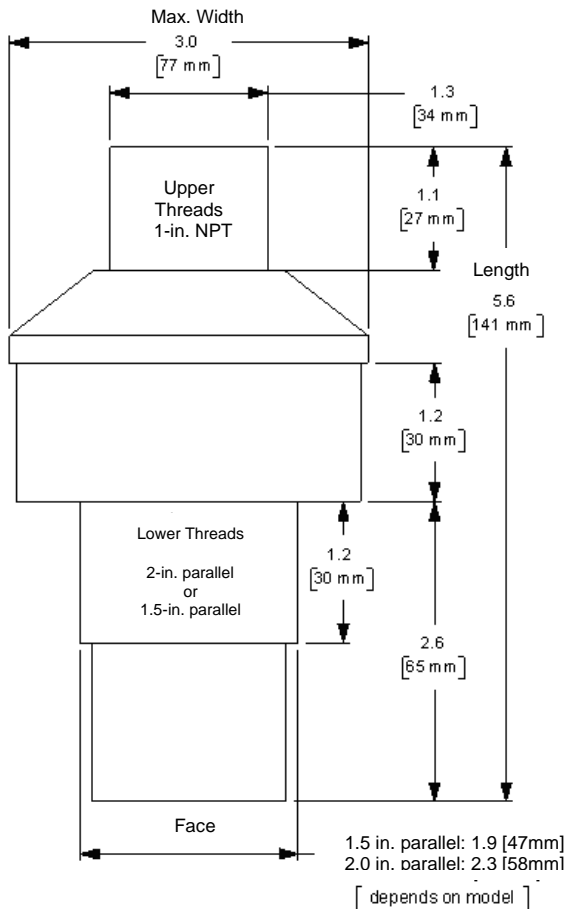


Figure 2 – Housing Dimensions

Installation

Precautions

- Keep unintended targets from the transducer’s field of view. Keep the beam pattern in mind.
- Keep the transducer away from ultrasonic noise sources, such as pressurized air nozzles.
- Do not allow material to build up on the sensor face or sensor performance may suffer.

Orientation

Orient the sensor perpendicular to the liquid surface or target object for best results as shown in Figure 3.

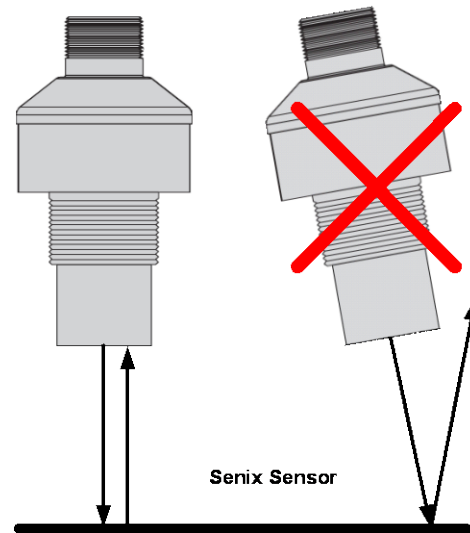


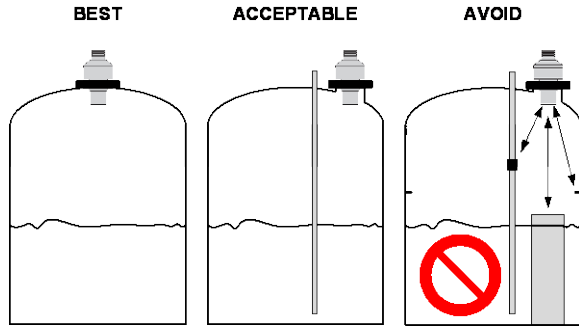
Figure 3 - Sensor Orientation

Ultrasound energy must reflect back to the sensor or the sensor will not detect the target, and may detect a later multipath echo (which would “measure” as a lower tank level).

Location and Obstacles

The sensor mounting location should be chosen so there are no obstacles in the beam path that reflect the ultrasound beam back to the sensor.

ToughSonic® CHEM Family Sensors – Installation & Operating Instructions



The sensor can be mounted close to a vertical pipe or tank wall if the wall or pipe surfaces are smooth (see “Acceptable” above).

Make sure that unintended targets between the sensor and liquid surface are not in the sensor’s beam area. Keep the sensor away from horizontal pipes, inflow points, vertical pipe seams, or tank seams if they are large enough to reflect the ultrasound. The sensor measures to the closest target and will detect submerged equipment if the level drops below the equipment. Position the sensor to avoid these issues (see “Avoid” illustration above).

Mounting



Figure 4 – Flange Mounting Figure 5 - Nipple Mounting







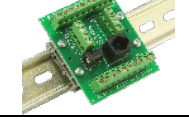
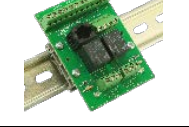


Typical tank installations have the sensor threaded into a flange as shown above or threaded into a nipple welded to the top of the tank. A plastic nipple or flange adapter is preferred. In both cases the mounting should ensure that the sensor is facing perpendicular to the liquid surface. Use no wrenches when screwing the sensor into the nipple or flange.

Maintenance & Cleaning

Dust accumulation on the sensor face can be cleaned by blowing pressurized air across the sensor face. The sensor face can be cleaned with alcohol or any cleaner compatible with Kynar (PVDF).

Accessories

The following accessories are available.

	WhitmanVIEW Software Configure, test and clone sensors. Compatible with all ToughSonic models. Download free from www.Whitman Controls.com
	UAN-KIT-USB-232 UAN-KIT-USB-485 PC Interface kits. Choose RS-232 or RS-485 to match sensor. Converter, terminal block, power supply, data cable, thumb drive included.
	UA-USB-232-ISO Use with UA-CC-232 to connect to a USB port at the PC with Isolated inputs. 3 ft USB cable
	UA-USB-485-ISO Use with UA-CC-485 to connect to a USB port at the PC with Isolated inputs.
	UA-CC-232 UA-CC-485 DB9 adapter and 6-ft data cable. Joins ISO converter to termination boards.
	UA-USB-232-TB UA-USB-485-TB Non-isolated serial converter to USB with termination board and 3-ft USB cable
	UA-TS-TB Termination Board to connect any model sensor, user equipment, power, and serial interface cable. DIN rail mounts included
	UA-TS-TB-2RYC Termination board with 2 relays (driven by sensor switch outputs), power input, serial interface jack. For any model sensor
	UA-JBOX-485 RS-485 Serial and Power wiring junction box, used on all serial-only sensor networks
	UA-DATACORD 6-ft with RJ11 each end. For patching termination board and serial converter.

INTERFACES

Wiring

Fully equipped CHEM sensors have a potted-in 9-wire shielded cable with the following wire assignments:

Wire Color	Wire Function
Brown	+DC input voltage (Power Input)
Blue	-DC input and signal common (Ground)
Gray <i>(data #1)</i> <i>(note 1)</i>	LVL-xxxx-232: RS-232 out
	LVL-xxxx-485: RS-485 -
Yellow <i>(data #2)</i> <i>(note 1)</i>	LVL-xxxx-232: RS-232 in
	LVL-xxxx-485: RS-485 +
Serial only models have just Brown, Blue, Gray & Yellow	
Black	Sinking Switch #1 <i>(note 2)</i> OR Sourcing Switch #1 (page 15)
White	Sinking Switch #2 <i>(note 2)</i> OR Sourcing Switch #2 (page 15)
Green	4-20 mA sourcing loop (page 13)
Orange	4-20 mA sinking loop (page 13)
Violet	0-10 VDC (page 13)
Silver	Cable shield (bare stranded wire)
Notes: (1) The gray and yellow wire functions depend on sensor model, and can be used for synchronization (page 22) (2) Factory default selections (can be changed using WhitmanVIEW)	

Table 2 - Wire Assignments

Ground (blue wire)

The ground wire is common to both the power supply and the output circuits.

Cable Shield (bare wire)

The cable shield is not terminated at the sensor. This wire should be terminated to equipment ground near the user equipment, preferably to a single point ground for all equipment. This is important if the cable is lengthened and/or routed near electrically noisy wiring or equipment.

Power Input (brown wire)

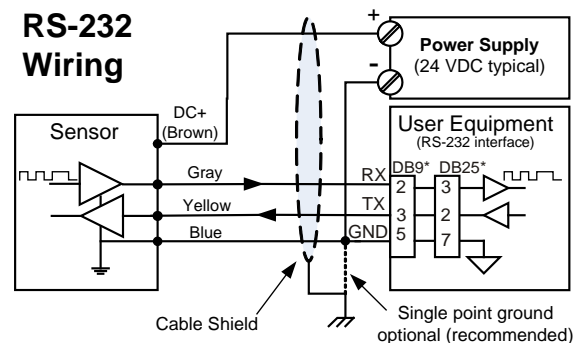
Connect a DC power supply to the DC+ (Brown) and GND (Blue) wires. These colors conform to EU standards. Reversing the power connections will not damage the sensor. A power supply voltage between 15-30 VDC is recommended. A +24 VDC supply is a commonly used standard. Target sensitivity and the maximum voltage output value is reduced at power supply voltages below 15 VDC. When power is applied the sensor operates as described on page 21.

Data Connections (gray & yellow)

Serial data interfaces are described on page 18. They are used for:

- WhitmanVIEW PC configuration (page 32)
- Synchronization (page 22)
- User communications between the sensor and an external data communications device

LVL-xxxx-232 models require an RS-232 interface and connect directly to a PC COM (serial) port for WhitmanVIEW configuration as shown below, or by USB converter as in the UAN-KIT-USB-232 kit.



* Typical personal computer connections for 9 and 25-pin serial COM connectors

Figure 6 - RS-232 PC COM Port Connections

LVL-xxx-485 models require a RS-485 interface, like Whitman Controls's UAN-KIT-USB-485 interface kit. See Accessories on page 11.

Analog Outputs

CHEM sensors have three analog outputs - voltage, sourcing current loop and sinking current loop. They all share the same *endpoints* and slope (decreasing or increasing with distance). They are simultaneously available on separate wires.

Voltage Output (violet wire)

This figure shows a voltage output connection:

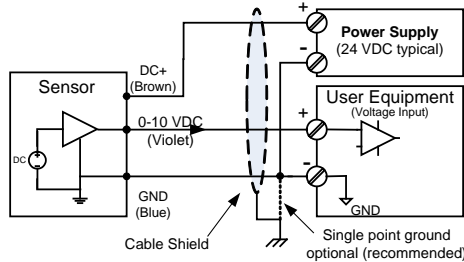


Figure 7 - Voltage Output Wiring

The default voltage output is a 0 to 10 volt DC signal proportional to the measured distance between the *endpoints* set by the user. The voltage range limits are adjustable to values between 0 and 10 volts using WhitmanVIEW (see d & e in Figure 10). The voltage is measured relative to GND (BLUE wire). The 0 and 10 volt *endpoint* distances affect all voltage and current loop outputs, and can be set anywhere in the sensor's *operating range* using WhitmanVIEW.

Sourcing Current Loop (green wire)

This figure shows a sourcing current loop connection:

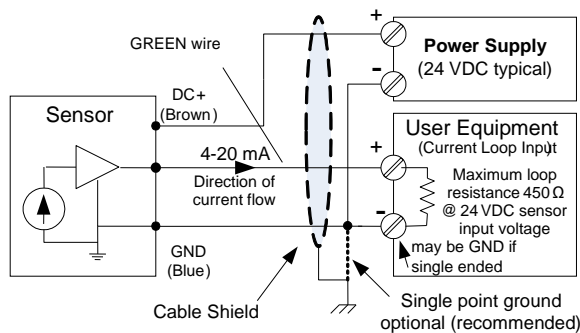


Figure 8 - Sourcing Current Loop Wiring

The default sourcing loop output is a 4 to 20 mA signal proportional to the measured distance between two *endpoints* set by the user. The *current low/high values* are adjustable to any values between 0 and 20 mA using WhitmanVIEW (see d & e in Figure 10) (4 mA

minimum is recommended). In a sourcing loop current flows out of the sensor, through the user equipment and back via the sensor's ground (BLUE wire).

Sinking Current Loop (orange wire)

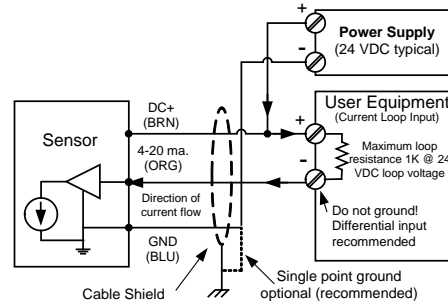


Figure 9 - Sinking Current Loop Wiring

The default sinking loop output is a 4 to 20 mA signal proportional to the measured distance between two *endpoints* set by the user. The *current low/high values* are WhitmanVIEW adjustable and match those of the sourcing loop. Current flows from the power supply through the user equipment then INTO the sensor (ORG wire) as shown in Figure 9.

The analog inputs of User Equipment in Figure 9 are either differential (both + and - terminals) or single ended (+ and GND terminals). A differential input is recommended at the user equipment. If the user equipment is single ended (+ input and GND) the sensor and user equipment cannot share a common ground or the current loop will not work.

Endpoints and Slope

The voltage and current loop(s) are spanned between the same two *endpoint* distances (see b & c in Figure 10). *Endpoints* can be set anywhere in the sensor's *operating range* using WhitmanVIEW.

All analog outputs must have the same slope, i.e., increase or decrease in value in proportion to distance. The high and low output values (voltages and currents), however, are independently adjustable in WhitmanVIEW for the voltage and current loops.

Response Time


Analog response time is affected by measurement rate and filter selections (pg.26).

Analog Displays in WhitmanVIEW

The sensor's calculated analog output values are shown in real time on the WhitmanVIEW meter displays (page 24).

WhitmanVIEW Analog Adjustments

Use WhitmanVIEW to tailor the sensor for best results in the application. Analog features are shown in Figure 10. The letters used below are keyed to that figure:

- Click the **Workspace** icon to edit parameters
 - Low Endpoint:** Click the numeric value (b) to set the end distance where the low limits (e) occur.
 - High Endpoint:** Click the numeric value (c) to set the end distance where the high limits (d) occur.
-  The analog slope will automatically reverse if the Low and High Endpoint distances (b & c) are set in reverse order
- High Values:** Click the numeric value to change the highest voltage or current value. The voltage and current entries are independent.

- Low Values:** Click the numeric value to change the lowest voltage or current value. The voltage and current entries are independent.
- Click the **Analog** icon for additional features.
- Select the output values set at power-on. These values exist until the first *measurement process* is completed.
- Select the output values to be set if no target is detected in the *Operating Range* (j to k).
- Applies to synchronization (page 22) and is grayed out if the sensor is not a slave.
- Range MIN:** The closest distance the sensor will report a correct distance (see page 22).
- Range MAX:** The farthest distance the sensor will detect a target (see page 22).

All sensor parameters are described on page 36.

Workspace parameter changes must be saved to the sensor to take effect, and can also be saved to disk for later recall as described on page 31.

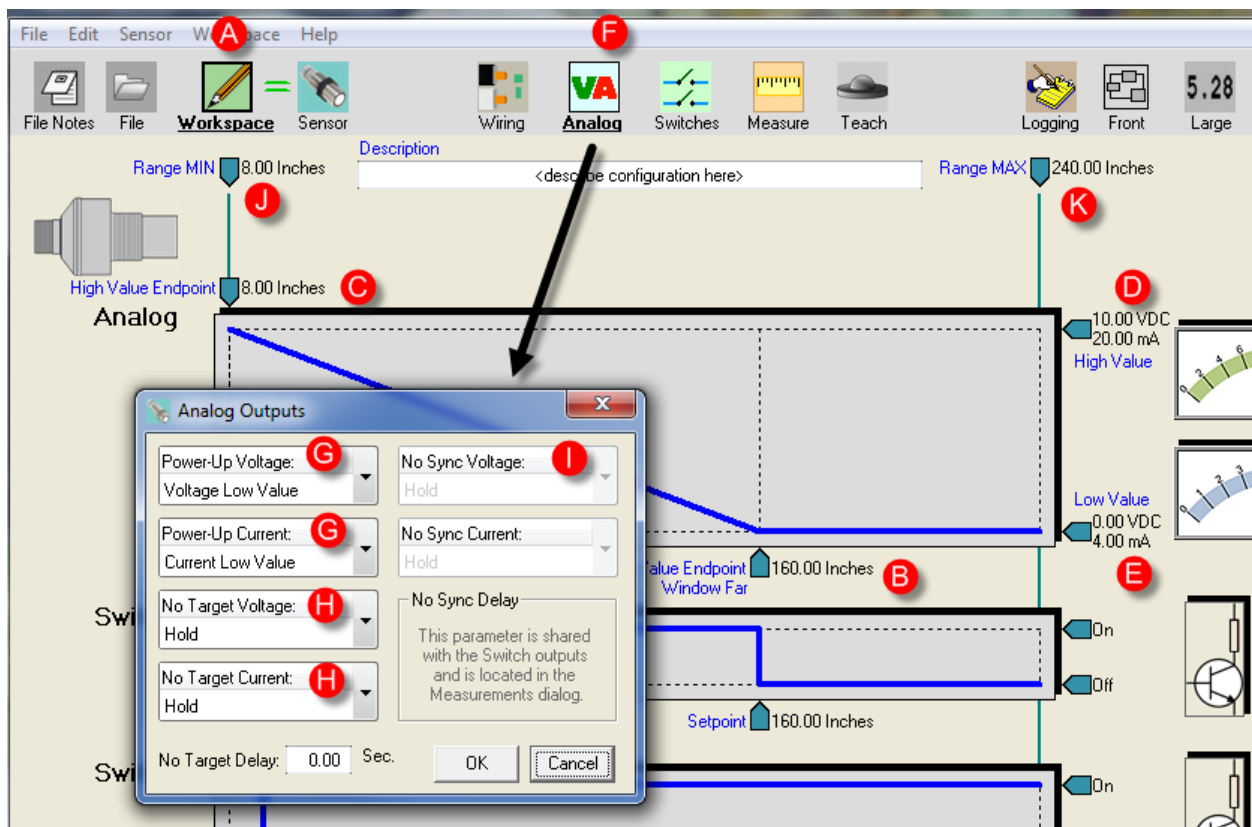


Figure 10 - WhitmanVIEW Analog Adjustments

Switch Outputs

CHEM sensors have two solid-state switch outputs. Switch #1 is on the black wire and switch #2 on the white wire. The default switch types are NPN (sinking). The switch type can be selected as either sinking (NPN), sourcing (PNP) or OFF using WhitmanVIEW (page 33).

Low and High Alarms

The factory default settings for the switches are typical LOW and HIGH ALARMS. Switch #1 set as a LOW ALARM (switch OFF when level drops below the Optimum range) and Switch #2 set as a HIGH ALARM (switch OFF when level is above a high setpoint). Both levels are adjustable using WhitmanVIEW.



The ALARM condition is defined as SWITCH OFF so that a broken alarm wire also causes an alarm (*fail-safe*). All of this can be altered using

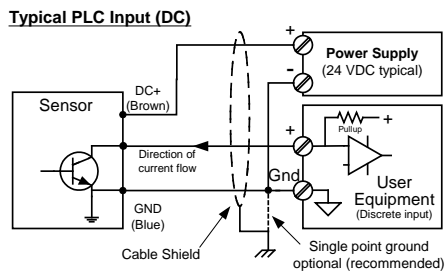
WhitmanVIEW.

Switch Output Voltage

When a sinking switch is ON the voltage of the switch wire will be near 0 VDC, and when OFF will be near the voltage of the external “pull-up” source.

When a sourcing switch is ON the voltage of the switch wire will be near the sensor’s power supply voltage and when OFF will be near 0 VDC.

Sinking Switch Output (NPN)



Other Typical Uses

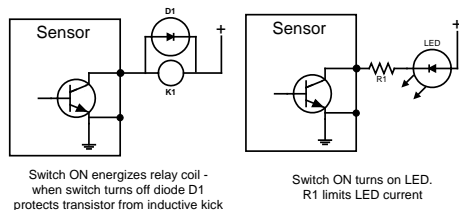
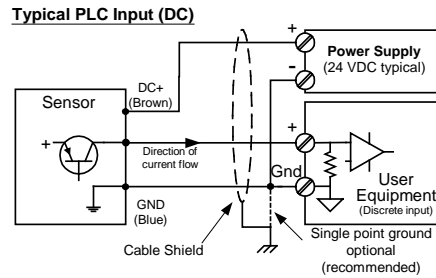


Figure 11 - Sinking Switch Output Wiring

A *sinking switch* is an open collector transistor (solid state *switch*) that sinks current through an external load to GND when ON. The external device can be powered from a source different than the sensor.

Sourcing Switch Output (PNP)



Other Typical Uses (power & GND not shown)

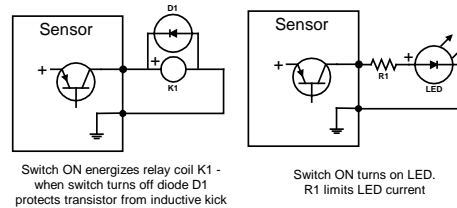


Figure 12 - Sourcing Switch Output Wiring

A sourcing switch provides current to an external load to turn that load ON or OFF as shown in

Current is sourced by the sensor’s power supply, and must be considered when determining the sensor’s maximum current draw.

Switch Response Time

Switch response times are affected by measurement rate and filter selections (pg. 29).

Switch Displays in WhitmanVIEW

The sensor’s switch output states are displayed in real time in WhitmanVIEW (page 24).

WhitmanVIEW Adjustable Switch Features

Basic and extended features assure optimum system settings and control functions that otherwise require external logic or time delay relays. Each switch has the following configurable features:

- Setpoint (ON switching distance)
- Polarity (ON closer or farther than setpoint)
- Mode = Setpoint (with Hysteresis) or Window (see Figure 13)
- ON and OFF time delays for state changes
- “No Target” state and time delay
- Power-up state

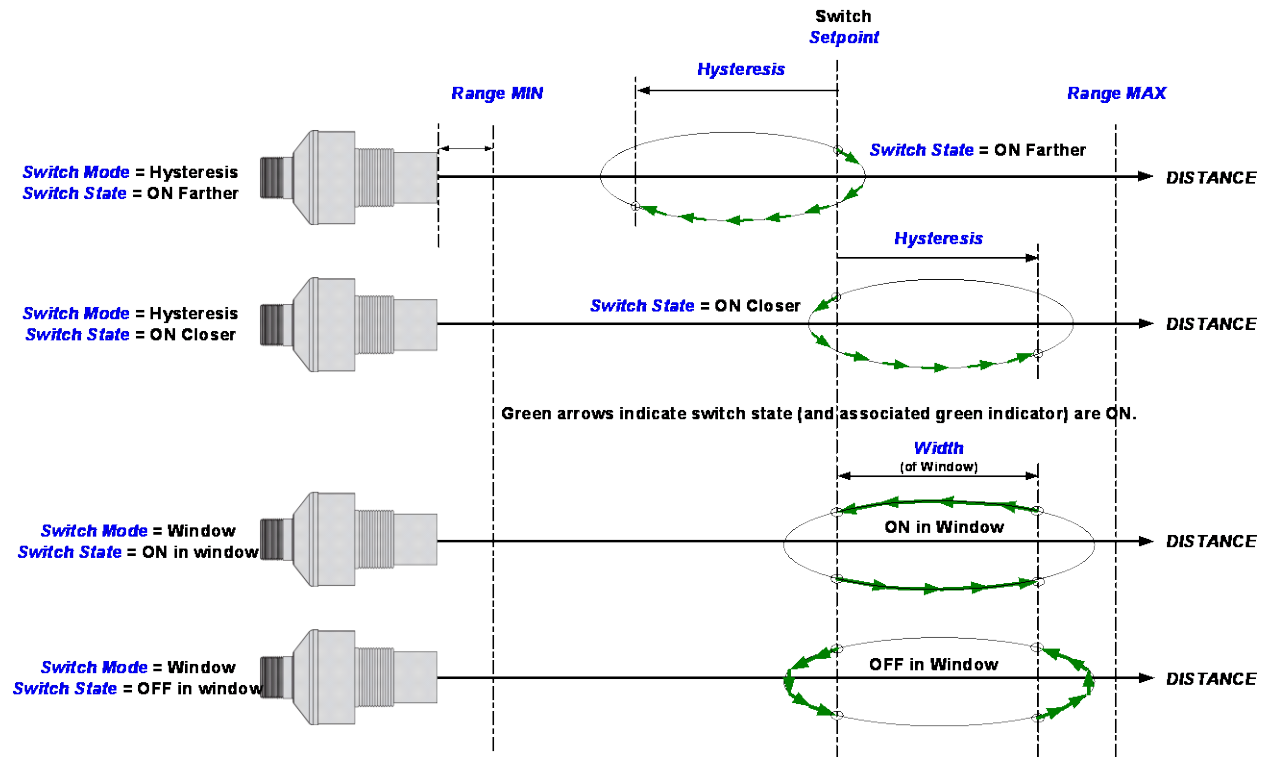


Figure 13 - Switch Hysteresis & Window Modes

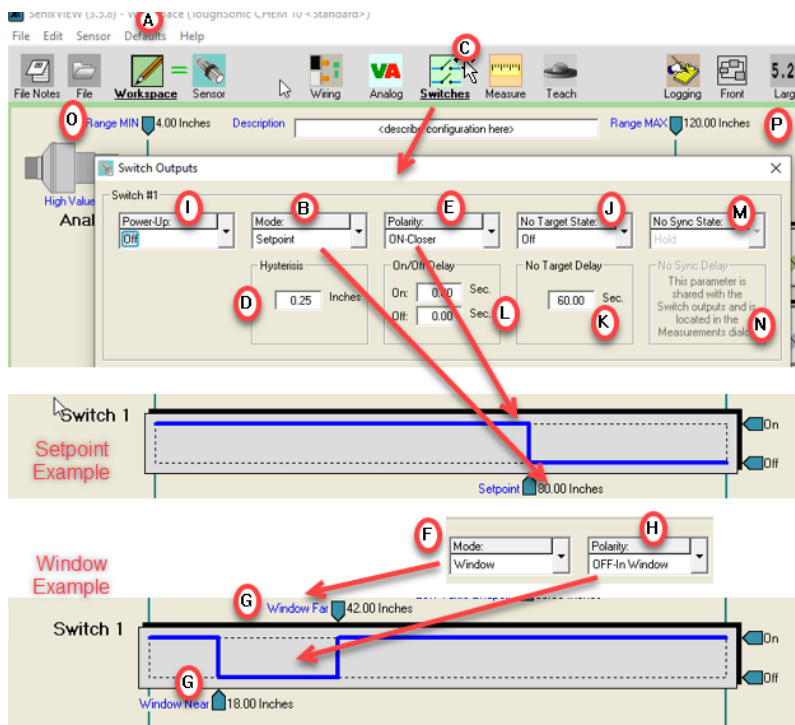


Figure 14 - WhitmanVIEW Switch Adjustment

WhitmanVIEW Switch Adjustments

Use WhitmanVIEW to tailor the sensor for best results. Switch features are shown in Figure 14. The letters used below are keyed to that figure:

- a) Click the **Workspace** icon to edit parameters
- b) *Setpoint*: Click the numeric value to set the distance where the switch turns ON (the switch turns OFF by reverse *hysteresis* distance (d))
- c) Click the **Switches** icon for additional features.
- d) Hysteresis is the distance the target must move in the reverse direction of the *Setpoint* to turn OFF.
- e) The polarity can be either ON CLOSER or ON FARTHER than the *Setpoint*. This is like setting a normally open or normally closed condition.



Reversing the switch polarity also reverses the hysteresis (d) direction!

- f) **Window** is an alternate mode where the switch state is *Polarity* (h) inside the window (over a range of distances) and the reverse if outside.
- g) Click these numbers to enter the window SIZE. The size is added to the *Setpoint* distance to become the far window distance.

- h) The Polarity can be either ON or OFF for targets within the window. This example shows OFF
- i) Select the switch state to set at power-on. This state exists until the first measurement process is completed.
- j) If the sensor loses the target the state can be **held** or set **on** or **off** (after delay k).
- k) If the sensor loses a target for this time period the no target state (j) is set (0 = immediate)
- l) Time delays can be required before turning a switch on or off. A switch state is set if a target continuously satisfies that state's requirements for the full delay time period.
- m) Applies to synchronization (page 22) and is grayed out when the sensor is not a SYNC slave.
- n) Applies to synchronization (page 22). Set in the **Measure** window as it also affects the analogs.
- o) *Range MIN*: The closest distance the sensor will report a correct distance (page 22).
- p) *Range MAX*: The farthest distance the sensor will detect a target. See page 22 for a detailed description of the sensor *Operating Range*.

Serial Data Interface

The YELLOW and GRAY serial data communications wires are used for three purposes:

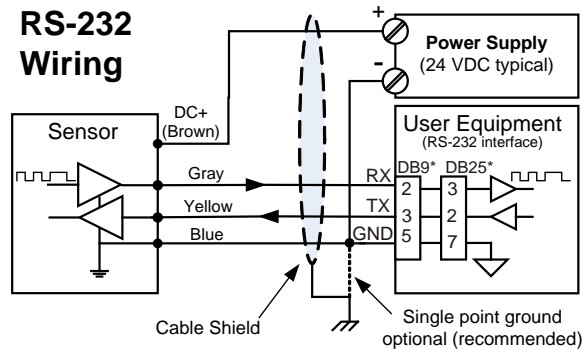
1. **Setup** – Connect to a PC running WhitmanVIEW™ software for setup, calibration, analysis and rapid sensor cloning.
2. **User Applications** – Connect to an external system and provide distance measurement data. Several operating modes are available.
3. **Synchronization (SYNC)** – Time synchronize a group of 2-32 sensors (see page 22).

The electrical interface can be RS-232 or RS-485:

- LVL-xxxx-232 sensors are RS-232
- LVL-xxxx-485 sensors are RS-485
- All models are RS-485 in SYNC modes

RS-232 (PC COM Port)

LVL-xxxx-232 models use a serial data RS-232 interface directly compatible with a PC COM port. The PC COM wiring is shown in Figure 15.



* Typical personal computer connections for 9 and 25-pin serial COM connectors

Figure 15 - RS-232 PC COM Port Connections

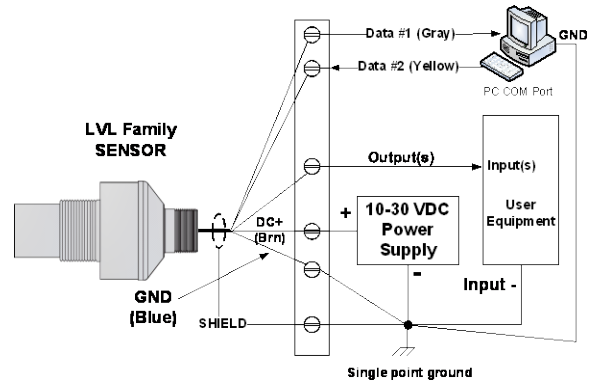


Figure 16 - LVL-xxxx-232 Connections

RS-485 & Addressable Networks

LVL-xxx-485 models use a serial data RS-485 interface that can be used over long distances. A single sensor is shown below connected to an RS-485 port. To use WhitmanVIEW with these models the PC must have an RS-485 adapter connected. Adapters are available to convert COM or USB ports to RS-485.

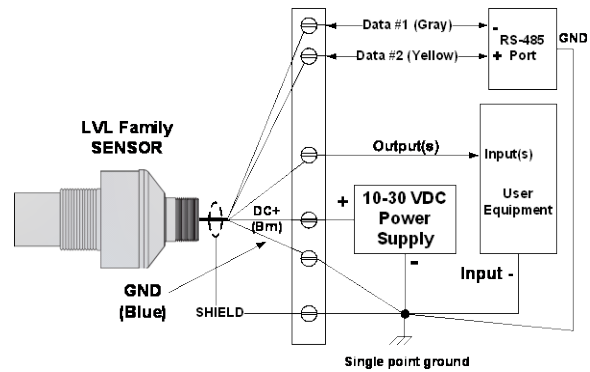


Figure 17 - LVL-xxxx-485 Connections

Up to 32 addressable sensors can be connected to the RS-485 bus. Sensors can be configured into RS-485 addressable multi-drop networks as shown below.

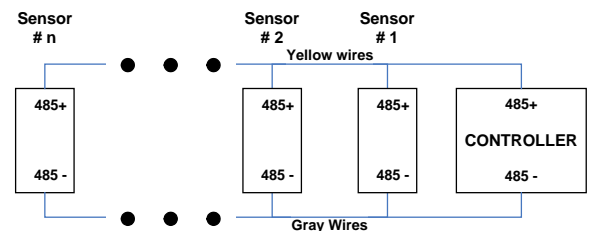


Figure 18 - RS-485 Network Wiring

Before connecting to a network each sensor must be assigned a unique address and all sensors must be

configured to the baud rate of the network controller, as described in following. The address assignments must also be different from other connected (non-Whitman Controls) devices.

Sensors used in a network must be configured in *continuous* or *start-on-poll* measurement activation depending on the needs of the system (page 21).

Serial Parameters

Baud Rate, Parity, Stop Bits

The default parameters are 9600 baud, no parity, and one stop bit (8N1). The baud rate is WhitmanVIEW adjustable to 9600, 19200 or 38400 baud. The parity and stop bit cannot be changed. The parameters affect both the Modbus and ASCII streaming protocols.

Sensor Address

The default sensor address is 1. The address is WhitmanVIEW adjustable from 1 to 247. Sensor address 0 is a special broadcast address that all sensors respond to.

WhitmanVIEW requires a correct sensor address to establish a connection. In general, leave the address at the default of 1 unless using the sensor in a network.

Each sensor being connected to a multi-sensor addressable network must first be assigned a unique address. Sensors with the same address will conflict and appear non-functional. Addressable multi-sensor networks are only possible with an RS-485 interface (requires LVL-xxx-485 models).

The sensor address is not used in the ASCII streaming protocol.

Changing Communications Settings

A single sensor in the factory configuration, wired to either an RS-232 or RS-485 interface, connects to WhitmanVIEW using the default 9600 baud rate and sensor address #1.



*Baud rate and address settings are not affected by selecting the factory default configuration (menu: **Workspace – Default LVL Setting**)*

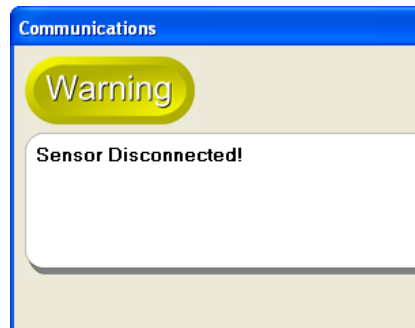
If multiple sensors are connected into an RS-485 network each must be assigned a unique address.

The baud rate and address are changed in WhitmanVIEW as:

1. Connect to the sensor (menu: **Sensor – Connect**), described on page 32.
2. Select the communications parameters (menu: **Sensor – Communications**) and see:



3. Select a different baud rate, or enter a unique address from 1 and 247, then click OK and see:



4. The sensor will now connect (menu: **Sensor – Connect**) using the new parameter values.

WhitmanVIEW Network Connect

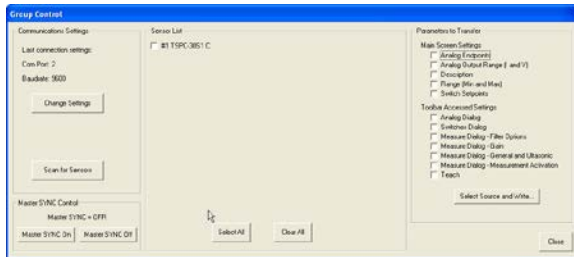
WhitmanVIEW is fully functional when connected to a single CHEM sensor on an RS-485 network (menu: **Sensor – Connect**). Simply enter the correct baud rate and network address to establish the connection.

WhitmanVIEW Group Control

Group control is for global parameter changes made to a network of sensors. WhitmanVIEW can update selected parameters quickly to a group of RS-485 connected sensors using menu: **Sensor – Group Control**. The group is first scanned and a list of connected sensors produced. Selected parameters can then be written to selected sensors.

To Use Group Control

1. First, enter the parameter values to be transferred into the Workspace.
2. Select menu: **Sensor – Group Control** to produce the following control window:



3. Click Scan to initiate a sensor search of all network addresses. Up to 32 found sensors will be listed in the center display area with (a) a check box, (b) the model number and (c) the activation. n mode (C=continuous, P=start on poll, Mx=master x phases, Sx=slave phase X). The check boxes can be individually selected, all checked using *Select All*, or all cleared using *Clear All*.
4. The “Parameters to Transfer” section on the right side lists parameter collections that can be selected for upload to all checked sensors. Check the desired collection(s).
5. Click *Write* to begin the batch transfer.



Group operations require WhitmanVIEW to operate as the bus Master. Any other bus master must first be disabled or disconnected.

communications except SYNC (page 22). Other user controllers can use this interface to obtain distance measurements or control sensor parameters. Request document *Whitman Controls ToughSonic Sensor Serial Communications Formats*.

ASCII Streaming Protocol

A Whitman Controls ASCII protocol is also available that transmits an ASCII string after each measurement under continuous measurement activation. This provides a simpler method of transferring measurement data to displays or other devices without using Modbus. WhitmanVIEW version 3.0.108 or later includes a feature to enable this protocol in menu item **Sensor – Connect – Advanced** features.

After each measurement or measurement process the sensor transmits five ASCII numbers terminated with a carriage return. For example, 05261 <CR>, or in equivalent hexadecimal: 30H - 35H - 32H - 36H - 31H - 0DH. This number represents a count value proportional to the detected target distance (except 00000 which means no target was detected). The user equipment can either display the ASCII data directly, such as viewing the output data on Windows HyperTerminal, or calculate distance by converting the data to binary and multiplying by a scale factor. The scale factor varies with the sensor series. The scale factors at 69 degrees F (or with temperature compensation enabled) for each sensor series are listed in Table 1 on page 8 at *Resolution (serial data)*.

As an example, the scale factor for an LVL-100 sensor is 0.003384 inches/count. If the count value is 05251, the distance is calculated as 5251 x 0.003384 = 17.77 inches.

Serial Data Protocols

CHEM sensors offer these protocol options:

1. **Modbus Slave** – This default protocol is used by WhitmanVIEW and supports sensor communications by address, typically in RS-485 networks.
2. **ASCII Streaming** – A simpler continuous ASCII protocol for one-way transmission of data to external devices (page 20).
3. **SYNC** – SYNC master and slave sensors use the serial interface for synchronization (page 22).

Modbus Protocol

CHEM sensors and WhitmanVIEW use the industry standard Modbus protocol for all serial data bus

Operation

Power Up

The following occurs within 1200 ms of power ON:

- Outputs are set to their power-up states (WhitmanVIEW selected)
- Sensor begins first measurement or becomes available for *start-on-poll* activation
- The analog and switch outputs are set, and distance data becomes available, after completing the first measurement process

All sensor outputs remain in their power-up conditions until the first *measurement process* has completed.

Measurement Activation

Sensor measurements can be activated in two ways – *continuous* or *start-on-poll*. The factory default and most common is *continuous*. The activation options are set using WhitmanVIEW by clicking the **Measure** icon then using the Measurement Activation selector (Figure 19).

Sensor features affected by the activation mode are summarized in Table 3 below. Refer to the *measurement process* definition on page 23.

Measurement Activation Mode Selected	When the Measurement Starts	• Features Allowed						When the Analog and Switch outputs are updated	Serial Data Bus (RS-232 or RS-485)
		Filters							
		X of Y	Closer of M	Farther of M	Averaging	Rate of change	Slow-Fast		
<i>Continuous</i> (factory default)	Repetitively at the <i>measurement interval</i>	•	•	•	•	•	•	After each measurement or <i>measurement process</i>	Last <i>measurement process</i> distance sent in response to distance poll
Start on Poll	Distance poll received (& current <i>measurement process</i> finishes)		•	•	•			After the measurement or <i>measurement process</i> triggered by the distance poll	Last <i>measurement process</i> distance sent in response to distance poll

Table 3 - Measurement Activation Summary

Activation Selection

Click the WhitmanVIEW **Measure** icon then locate the following Measurement Activation drop down menu:

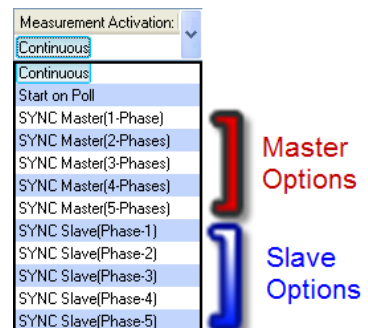


Figure 19 - Measurement Activation Selections

Synchronization

Groups of 2 to 32 sensors can be connected together and time synchronized for these purposes:

- Prevent sensors in close proximity from interfering with one another (“cross-talk”)
- Enable a group of sensors to measure a common target(s) at the highest possible rate

This feature is generally not used in level sensing applications and therefore not detailed in this document. Contact Whitman Controls for additional information.

Continuous Activation

This is the factory default. Measurements repeat continuously at the *measurement interval*. The analog and switch outputs are updated, and the distance data is stored, at the end of each *measurement process*. At any time a serial data controller can retrieve the last stored distance data by issuing a serial data read poll without effecting ongoing measurements. Continuous mode is generally used unless:

- There is an advantage to having the sensors measure only on request (see Start on Poll)
- Multiple sensors are connected in a synchronized group (page 22).

WhitmanVIEW will detect this mode when the **Sensor** icon is clicked, then repeatedly issue read polls to display the distance measurements.

Start on Poll Activation

Measurement begins when the sensor receives a serial data distance read poll from an external controller (or WhitmanVIEW). Upon completing the *measurement process* the analog and switch outputs are updated, the distance measurement stored, and the sensor stops measuring.



Several filters are disabled in Start on Poll activation (page 21).

To Poll from WhitmanVIEW

WhitmanVIEW detects start-on-poll mode when the **Sensor** icon is clicked, and displays polling controls in the upper right corner of the screen (Figure 20).

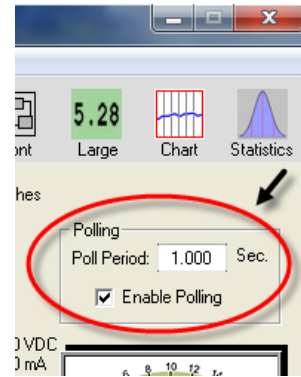
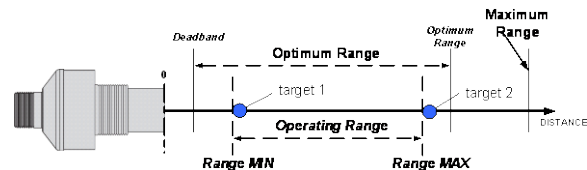


Figure 20 - WhitmanVIEW Polling Controls

SYNC Master and Slave Activation

Used only for synchronization.

Operating Range



The sensor measures the distance to targets within the *Operating Range* (target 1 to target 2). This range can be set in WhitmanVIEW by adjusting the *Range MIN* and *Range MAX* parameters. The factory default is the widest possible, *deadband* to *maximum range* (see specifications, page 7).

Range Min

The *Range MIN* is the closest distance that the sensor will report an accurate distance. Targets closer than *Range MIN* may be detected, especially at close range, but the measured distance will be *Range MIN* (or greater for secondary echoes). If the near distance is important, keep the target beyond *Range MIN*.

Range Max

The *Range MAX* is the farthest distance that the sensor will detect a target. Targets farther than *Range MAX* are ignored. If a target is not detected closer than *Range MAX* a “No Target” condition exists. WhitmanVIEW prevents setting the *Range MAX* parameter to a value greater than *Maximum Range*.

Under “No Target” conditions the analog and switch output values or states can be configured to either hold their prior or set specific values or states, either immediately or after adjustable time periods.

The “No Target” controls can be an important and useful tool to control system response by limiting the distance the sensor will consider a target valid.

Factory Defaults

The factory default range values are:

- Range MIN = deadband
- Analog far setpoint = Optimum range
- Range MAX = Maximum Range

Measurement Process

The *measurement process* includes the raw distance measurement, followed by one or more filter options (page 27), then any switch time delays (page 30) before the result is reflected in the sensor outputs.

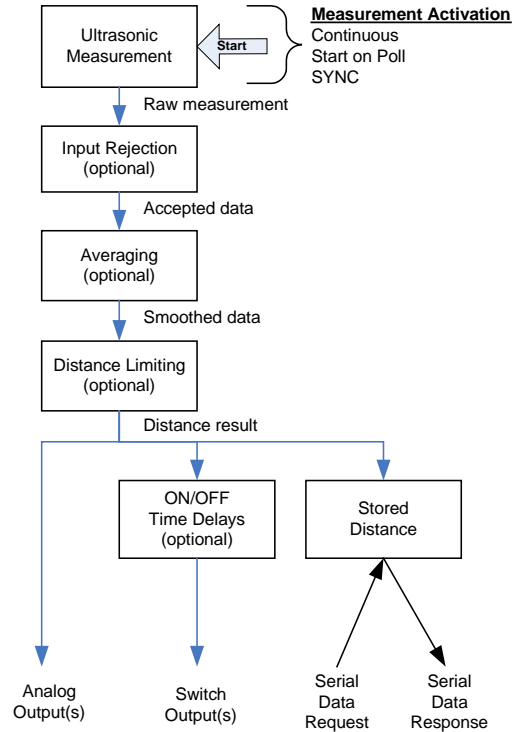


Figure 21 - Measurement Process Diagram

In Start on Poll activation the entire process is performed once per poll, i.e., M Input Rejection x N Averaging measurements (page 29). Some filters are disallowed in Start on Poll (page 21). If a poll is received before an ongoing *measurement process* finishes, the ongoing process will run to completion then another *measurement process* will begin.

Switch time delays can be set to implement special control functions. The most recent distance result can also be requested by an external controller over the serial data bus (page 20).

Sensor Viewing

When connected to a sensor (**Sensor** icon clicked), distance measurements are viewed in WhitmanVIEW in several ways. WhitmanVIEW obtains the measurements via serial data interface requests in the *continuous* or *start-on-poll* mode. The values or states of the selected output(s) are also displayed.

Sensor screen

Connect WhitmanVIEW to the sensor (menu: **Sensor – Connect**) as described on page 31. WhitmanVIEW automatically selects the **Sensor** icon ①, displays the distance in real-time with a repositioning target symbol ②, shows analog output value(s) on meters ③ and shows switch state(s) as symbols ④. Additional display icons ⑤ offer features described below.

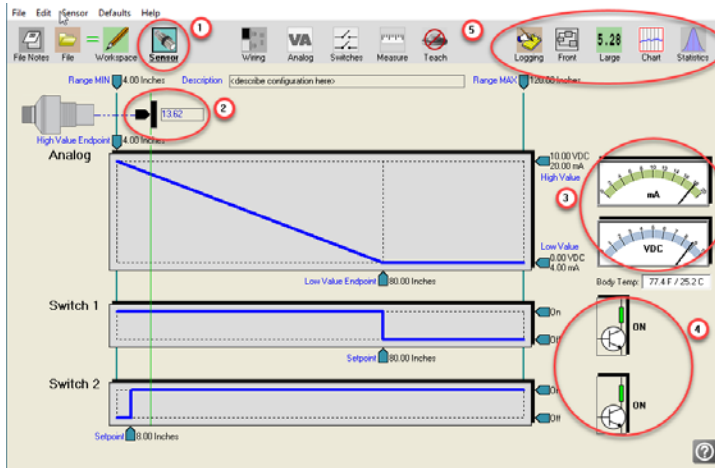


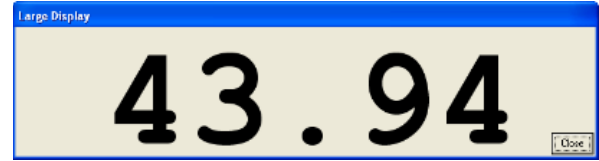
Figure 22 - WhitmanVIEW Distance Displays

Serial Only models

The WhitmanVIEW screen will display just the digital distance value in the users selected units.

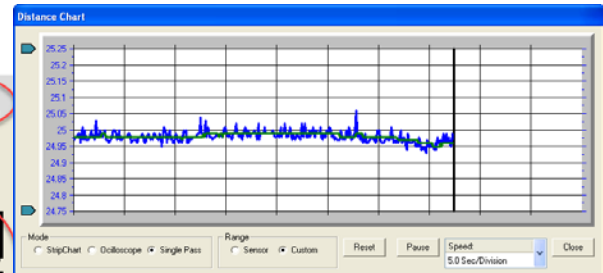
Large Display

Click the **Large** icon to pop up a large digital display that can be viewed from afar.



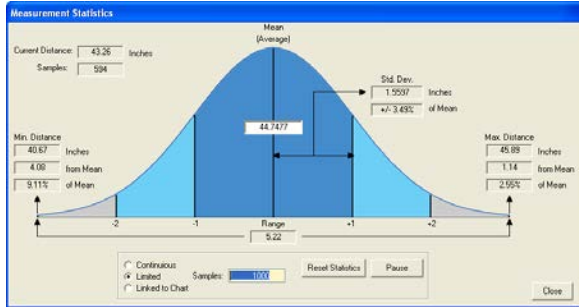
Strip Chart

Click the **Chart** icon to view data in strip chart format. Both filtered and unfiltered data are displayed.



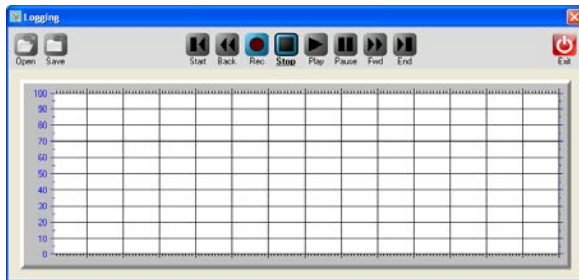
Statistics

Click the **Statistics** icon to view statistics calculations.



Data logging

Click the **Logging** icon to record data to disk for view or export to Excel.



Measurement Rate

The *measurement rate* is how often the sensor measures the target distance. It does not require adjustment in most applications. Default rates for each model are listed in Table 1 on page 8.

To accommodate special requirements the rate can be adjusted from .0001 to 200 meas./sec (*measurement intervals* from 2.78 hours to 5 ms) using WhitmanVIEW.

Maximum Target Distance Effects

The time required to detect a target is determined by the speed of sound. Sound travels at about 1 ms/ft. (3.3 ms/meter) so a target at 10 feet (3m) results in an echo delay of about 20 ms (the sound has to travel out then back). If the *measurement interval* is less than that time the target echo will go undetected, or may be detected in the next cycle, causing erratic measurements.

The maximum distance a sensor can detect a target is the shorter of (a) the sensor model’s maximum range, (b) the user-adjustable RangeMAX parameter, or (c) **the farthest distance a target echo can return before the next measurement begins (measurement rate limited).**

Setting the *measurement interval* faster than the default may restrict the maximum detectable target distance (see Table 4).

Measurements per second	Measurement Interval ms	Approximate Max Range in. (cm)
5	200	1080 (2743)
10	100	540 (1372)
20	50	288 (732)
40	25	144 (366)
100	10	54(137)
200	5	24 (61)

Table 4 - Maximum Range vs. Measure Rate

Measurement Stability Effects

If the measurement rate is set too fast the sensor may detect delayed echoes from a prior measurement cycle, causing measurement instability. This is more common at short distances but can also occur in large liquid tanks. Slower measurement rates are recommended for tank installations.

A delayed echo can be a more distant target or a multi-bounce echo from the primary target (echoes can bounce back and forth between two surfaces). This effect is also more prevalent at cold temperatures because sound absorption in air is lower and it takes longer for the echoes to decay.

Multi-echo issues are minimized by slowing the measurement rate, reducing the sensitivity, repositioning the sensor, and/or using materials to absorb or deflect the ultrasound.

Output Response Time

The default response time for all outputs is the *measurement interval*. The analog, switch and serial ASCII streaming (if enabled) outputs are updated after each measurement cycle.

The response time is affected by several sensor user-adjustable features using WhitmanVIEW:

1. The *measurement rate* (pg. 26) can be used to directly increase or decrease response time.
2. *Filters* (pg. 27) can be selected to process measurements for improved stability. Some *filters* update outputs after each *measurement interval* while others require several intervals. Filters can decrease response time.
3. *Time Delays* (pg. 30) can be used to create system responses that might otherwise require external controllers or time delay relays. They directly delay the response of the output(s) to which they are applied.

The factory default settings are listed in Filters on page 27 and Time Delays on page 30.

When testing a new application turn all filters and time delays off for best visibility of measurement stability!



Filters

Filters are processing features that reject and/or smooth measurements, and/or limit the rate of change of the sensor distance (and therefore outputs). Their purpose is to improve sensor performance in real-world applications. The factory default has a running average of 50 enabled to slow down the response to liquid level fluctuations.



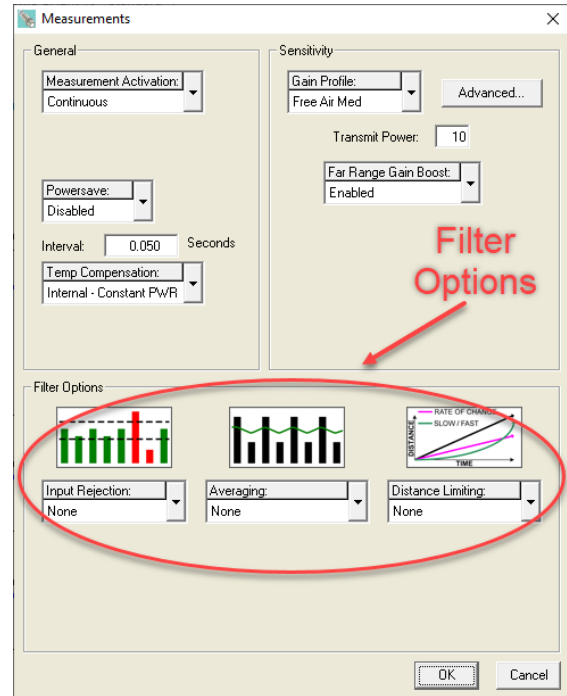
Turn filters off during setup to test measurement stability, then enable filters as required for the application.

Overview

Figure 23 shows the flow of distance measurements through the filters to the outputs. Filters are applied in order of flow from left to right (input to output). None or one selection can be made from each category (Input Rejection, Averaging and Distance Limiting). As filters are enabled the output response time is generally slower. Some filter settings are not usable in applications requiring a fast response time.

WhitmanVIEW Filter Selection

Click the **Measure** icon on the main screen to open the Measurements window. The location of the Filter Options is shown below.



When using filters, the first valid measurement after power ON becomes the initial condition for all further processing. The Filter Options are shown in block diagram below, followed by a description of each.

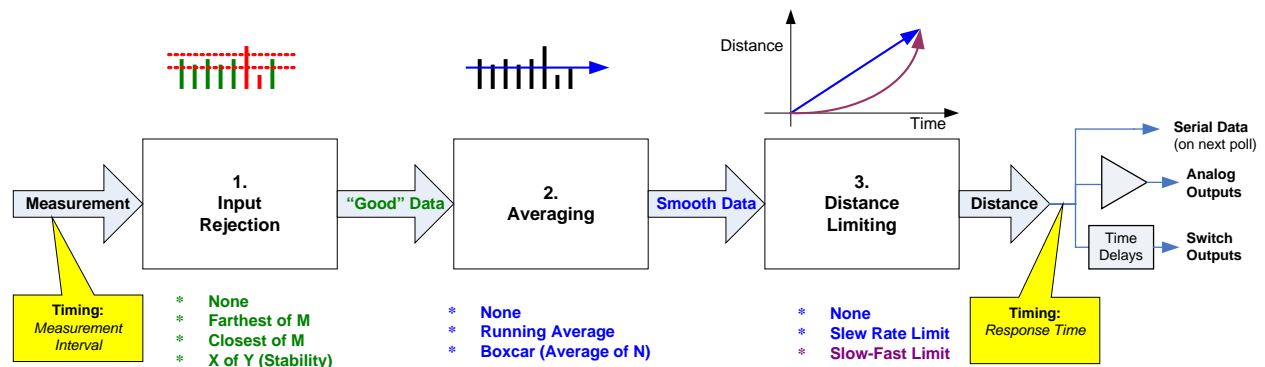


Figure 23 - Filters Block Diagram

Input Rejection Filters

Input rejection filters ignore some measurements. The input to these filters is the raw sensor distance measurement. The output (“Good” data) is then input to an averaging filter (if used).

Closest of M Measurements

The sensor performs M distance measurements and rejects all except the closest. The number of samples (M) can be set to any value from 2 to 999. The *response time* is slowed by a factor of M. For example, if M=3 and the *measurement interval* is 50 ms the *response time* is 150 ms (not including any successive filters or switch time delays).

This filter is useful for applications where the desired result is the closest object detected in a given period of time. Examples include detecting the peak value of material flowing on a conveyor, or maintaining a measurement value of a poor target (weak or intermittent echo as in coarse bulk materials).

Farthest of M Measurements

The sensor performs M distance measurements and rejects all except the farthest. It is otherwise identical to the Closest of M filter described above.

This filter is useful to ignore an unintended or unwanted target that occasionally passes between the sensor and the intended target. Examples include ignoring mixer blades in tanks, ignoring traversing objects (not the intended target), or rejecting sporadic interference (electrical, physical or acoustic).

X of Y Filter (Stability)

At least X measurements of the previous Y must be within +/- 6.25% of the most recent measurement. All measurements are ignored until this condition is satisfied, i.e., the target must remain stable before the sensor will process it. If the target remains unstable a new distance measurement *will never be established*.



Instability is different from the “no target” condition. A perfectly detected target may be in motion and thereby unstable. Stable sensor mounting is also required.

The degree of stability required is user adjustable by changing the values of X and Y. The range of values for X is 1 to 7 and for Y is 2 to 7.

As long as each new measurement X falls within bounds the sensor response time is unaffected and the

latest X is available for output (excluding averaging and switch time delays used). If the input data fall out of bounds then a delay will occur before the filter criteria can again be satisfied. The delay for a re-stabilized target could range from 1 to X measurement intervals depending on the history of the prior Y measurements.

This filter is disallowed when using Start on Poll measurement activation.

Averaging Filters

The averaging filters receive their distance data from the input rejection filters (Figure 23). The averaging filter response time is therefore affected by the rejection filter selections. If an unstable target is detected by the stability filter (x of y), the averaging filter and subsequent processing are suspended at the current distance until stability returns. The distance output of the averaging filters is rate-of-change restricted by a distance restriction filter (if used).

Boxcar Average

This filter calculates the average of N inputs (N = 2 to 255) passing through the rejection filter. The process is repeated every N inputs. The *response time* is therefore slowed by a factor of N. For example, if M=3 for a rejection filter and N=10 for the Boxcar average then the update period at a 50 ms *measurement interval* is $50 \times 3 \times 10 = 1500$ ms.

Running Average

This filter calculates the average of N inputs (N = 2 to 255) passing through the rejection filter. The average is updated after each input rather than after N inputs as for the boxcar average. The output response of this filter is therefore smoother than the boxcar filter since the output is updated more frequently.

This filter is disallowed when using Start on Poll measurement activation.

Distance Limiting Filters

The distance limiting filters clamp the rate of change of measured distance before setting sensor outputs. These filters limit the rate of change of data received from the input rejection and/or averaging filters (Figure 23). The limited distance then drives the sensor outputs (not including switch time delays).

Rate of Change

A maximum rate of change of distance ($\Delta D/\text{sec}$) is limited to a maximum value, whether increasing or decreasing. The maximum value is a user-entered parameter with a range of .003 in./sec to 173 in./sec.

An example use of this filter is limiting the rate of change allowed when driving a motor or other mechanical system.

Slow-Fast

If the target position changes quickly, the sensor assumes it is a false change but starts to recalculate slowly toward the new position. If the new position remains stable the sensor gradually increases the rate of change of measurement toward the new position until it is reached.

This filter is disallowed when using Start on Poll measurement activation.

This filter is used for targets that change position slowly but have occasional interruptions. Examples:

- Measuring a roll diameter - holds a stable roll measurement yet readjusts the measurement in a reasonable time during changeovers
- Mixer tanks - Ignores rotating mixer blades that pass occasionally between the sensor and liquid.
- Ignore unintended targets passing between the sensor and the intended target, such as a traversing mechanism on a printer ink well.

Output Response Time

The output update rate is a function of the *measurement interval*, filter selections and parameters, and switch time delays (page 30).

Filter (2)	Update Interval Multiplier (of measurement interval)
Closest of M Farthest of M	M
X of Y (1)	1 (stable target) 0 (unstable target)
Boxcar Average	N
Running Average	1
Rate of Change Slow-Fast	1
(1) Once detected, regaining a target will be delayed by 1 to Y measurement intervals. (2) During setup, turn off filters for best visibility of real-time measurements.	

Table 5 - Filter Response Time

Assuming measurement interval **I** with a default of 50 ms, here are some example response times:

- **No filters**
Response time = I (50 ms)
- **Closest or Farthest of 20 measurements**
Response time = I * M = .05 * 20 = 1 sec
- **Boxcar Average of 10 measurements**
Response time = I * N = .05 * 10 = 500 ms
- **Running Average**
Response time = I * 1 = 50 ms
- **Closest of 20 and Boxcar average of 10**
Response time = I * M * N = .05 * 20 * 10
Response time = 10 seconds

Time Delays

Time Delays are used to cause actions that might otherwise require external controllers or time delay relays. They delay the response of the output(s) to which they are applied, and are useful for control and alarm functions. All time delays are adjustable between 0 ms to 5.46 minutes at a 5 ms resolution.

Switch Time Delays

Each switch has 3 independently adjustable delays:

- On Delay (default = 0 sec)
- Off Delay (default = 0 sec)
- No-Target Delay (default = 60 sec)

A time delay begins when the condition that triggers it first occurs (a distance measurement that could turn a switch ON or OFF, or no target). Time delays are re-triggered, i.e., the trigger condition must remain active for the full time delay period or the time delay will be reset to zero. If the trigger condition remains for the full time delay period then the corresponding action takes place (switch turns on or off).

Switch time delay setup is shown on page 17.

Examples uses include:

- Set an alarm if the sensor loses the target for an excessive time period, or material stops flowing on a conveyor (jam condition)
- Force a switch state for a minimum time to assure correct operation of other equipment

Analog “No Target” Time Delay

The analog “no target” delay affects all 3 analog outputs (default = 0 sec). If the no target delay expires the analog outputs are set to their “no target” selections (high value, low value, or no change). The current loop and voltage have independent selections.

A time delay begins when the no target condition first occurs. The time delay is re-triggered, i.e., no target must exist for the full time delay period or the time delay will be reset to zero. If the no target condition

remains for the full time delay period then the analog outputs are set to their no target values.

Analog time delay setup is shown on page 14.

Example uses include:

- Force a system shutdown on loss of a target
- Controller detection of sensor’s *no target* condition by setting the output value outside the normal range

No SYNC Time Delay

Used only or synchronization (page 22). The default is 0 seconds.

Temperature Compensation

At room temperature, a change of 10 degrees will result in approximately 1% change in the speed of sound and therefore the measured distance. Temperature compensation can be enabled to reduce the impact of temperature changes in some applications. This is accomplished by clicking the WhitmanVIEW Measure icon and using the Temperature Compensation selector. The default is ENABLED.

The sensor must be protected from the sun or other forms of radiant or conducted heating.



ToughSonic® sensors have an internal temperature sensor. In applications where the sensor is continually powered a warm-up period of approximately 30 minutes should be allowed before calibrating. Best performance is obtained when the sensor body tracks the surrounding air temperature. The sensor will not compensate for rapid air temperature changes or for temperature variations between the sensor and target.

Temperature compensation is less important if the temperature environment in which the sensor is used remains fairly constant.

WhitmanVIEW Software

WhitmanVIEW software allows you to select and calibrate sensor outputs; modify sensor features (parameters); view, analyze and/or log measurements for performance evaluation; and save the resulting setups to disk for later recall and application cloning.

Install WhitmanVIEW

WhitmanVIEW runs on a Windows PC and connects to a CHEM sensor via a serial data COM port. Insert the thumb drive from a WhitmanVIEW kit (page 11). Run setup.exe and follow the directions. Or download WhitmanVIEW from <https://www.WhitmanControls.com/>

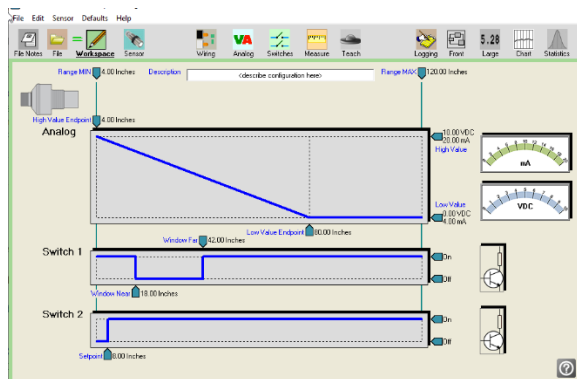
Application Setups

A *setup* is a combination of sensor parameters that you establish for an application. Setups can be created or changed in the WhitmanVIEW workspace, or moved in/out of the workspace from/to the sensor or file as shown below:



• Main WhitmanVIEW Screen

You have two screens available: Workspace view and Sensor view. Setup parameters are viewed and changed on the Workspace screen



or in pop-up dialogs by clicking one of these icons:



Sensor view contains current measurement, switch status and analog level.

• Workspace Screen View

The main screen displays a *setup* of (a) an attached sensor, (b) a file stored on the computer disk, or (c) the workspace, as selected by these icons:



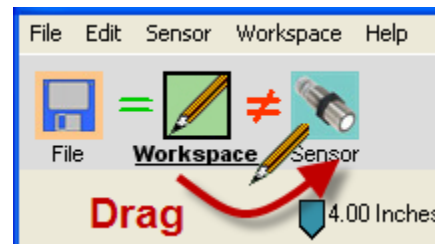
In this example the **Workspace** is displaying on the main screen (icon is outlined, with **bold underlined** title), and the workspace matches the file but not the attached sensor. Click the EQUAL sign to see a printable list of all sensor parameters. Click the NOT EQUAL sign to see which parameters aren't equal between views.

If the File icon is grayed out, clicking it will open a window to select a file from the computer disk. If the Sensor icon is grayed out, clicking it will open a Sensor Connect dialog to connect a sensor.

Moving a Setup

Setups can be moved between the Workspace and a disk file, or between the Workspace and a sensor. Movement is accomplished in three ways:

1. **Using Icons** - use the mouse to either (a) right-drag or (b) shift-left-drag the **Workspace** icon to either the **File** or **Sensor** icon. All movement must be in or out of the workspace. For example, to move workspace parameters to the sensor *right drag* the Workspace icon as shown below:



2. **Using Menu selections:**

File – Read File to Workspace
File – Write Workspace to File
Sensor – Move Sensor to Workspace
Sensor – Move Workspace to Sensor

3. **When connecting a Sensor** – When using menu **Sensor – Connect** (page 32) WhitmanVIEW asks if you want the setup copied to the workspace – click **Yes** to copy it.

Creating a Setup

Setups are created or modified in the Workspace. All Workspace setups are temporary and must be moved to the sensor or saved to disk. There are 3 ways to create a new Setup:

1. **Start with a Factory Default** – Click **Workspace** icon, then select menu: **Workspace – Default LVL-XXXX Settings**. Select the model of the sensor you intend to use with the new setup.
2. **Start with a Sensor** – Move a setup from a connected sensor into the workspace.
3. **Start with a File** – Move a previously stored disk file into the workspace.

After loading the workspace the parameters can be modified, then moved to a file or sensor. ***If the setup is not moved it is lost when exiting WhitmanVIEW.***

Saving a Setup

Make the workspace changes you want to test, saving them to the sensor as often as needed until the sensor is operating as needed. When finished, save the workspace to a disk file for future reference or cloning (see Moving a Setup). Use a meaningful filename when saving.

Connect a Sensor

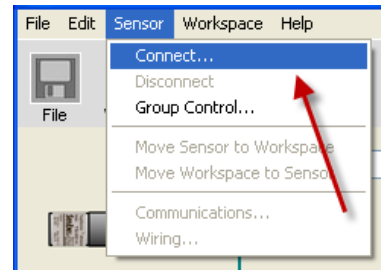
WhitmanVIEW requires both a physical and logical sensor-to-PC connection. Physical options include a direct 9-pin COM port connection or USB-to-COM adapter (see Whitman Controls offerings on page 11).



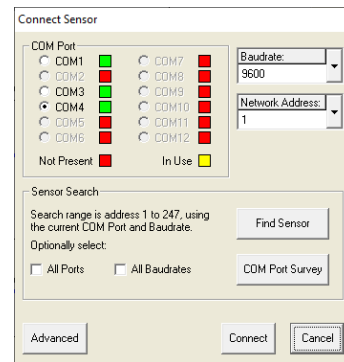
LVL-xxxx-485 models require a RS-485 interface converter or dedicated RS-485 interface.

1. **Install a cable** between the sensor and COM port. Use the cable included with a Whitman Controls software kit (page 9) or wire it yourself (page 18).
2. **Apply sensor power.**

3. **Logical Connection:** Connect WhitmanVIEW to the sensor using menu selections **Sensor – Connect**.

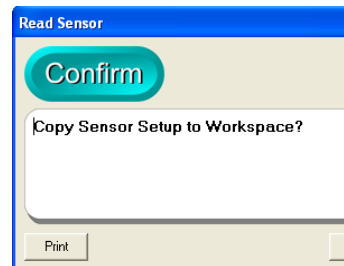


4. The Connect Sensor dialog then appears with either the default values or your previous selections. Make any changes then click Connect:



If you have difficulty determining the COM port, use the COM port survey tool. Run the survey both with the serial converter inserted and not and note the port number that appears or disappears. That is your port. If it isn't available among your 12 choices, use Edit > User Preferences to select a higher starting COM so the desired port is within the 12 ports displayed. Click Connect.

5. When the sensor is found, this message appears:

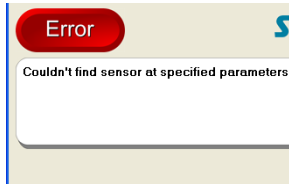


Move the parameters to the Workspace to (a) change them or (b) save them to disk. You can also move them later. If you intend to copy an

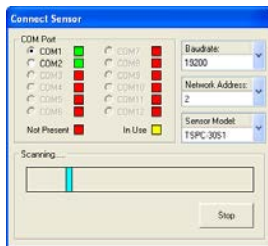
existing Workspace to the sensor (cloning this sensor) then click No.

WhitmanVIEW then connects to the sensor (**Sensor** icon automatically selected) and offers sensor viewing as described on page 24.

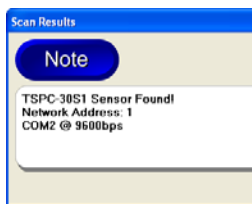
- If the following message appears check the (a) wiring, (b) power and (c) interface selections, or use Find Sensor to scan all sensor addresses:



- If the above error continues, use Find Sensor to scan all sensor interface combinations. The default is address is 1. Check the “All Ports” and/or “All Baud Rates” boxes if you are unsure of those. WhitmanVIEW will identify the first Sensor Model found, starting at address 1 through 247. The window will appear as follows as WhitmanVIEW searches for a sensor:



- When a sensor is found this message appears:



Click OK and the Connect Sensor dialog is redrawn with the correct parameters (step 4).

- Cannot Find Sensor:** Check the following:
 - Is the power ON?
 - Check the wiring connections

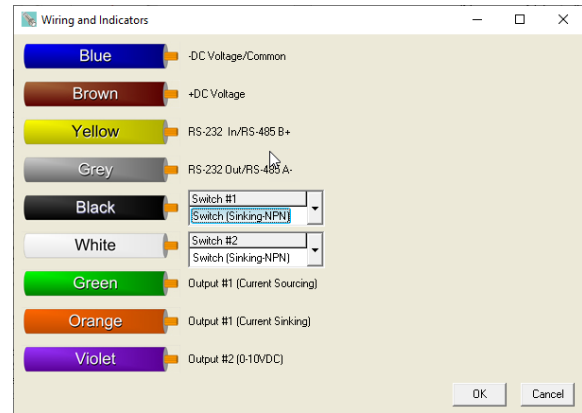
- Is the correct COM port selected?
- Is COM port working?
- Does the interface match the sensor model? LVL-xxxx-232 models use RS-232 and LVL-xxxx-485 models use RS-485.

Outputs



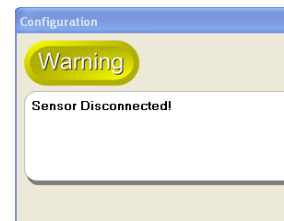
After connecting a sensor, click this icon to reconfigure the outputs.

The following 9-wire dialog appears, making it possible to reconfigure the switch outputs type to sinking (NPN), sourcing (PNP) or OFF.



Make output changes before connecting your equipment. Do not change outputs when connected to operating equipment!

If wiring changes are made and the OK button clicked, the changes are made and the sensor automatically disconnects from WhitmanVIEW:

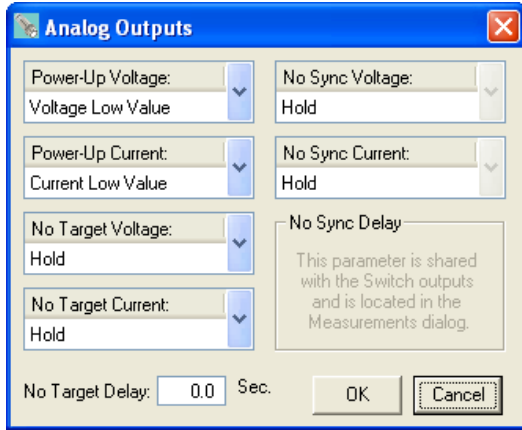


Reconnect WhitmanVIEW to the sensor (page 32) to resume WhitmanVIEW with the new outputs.

Analog Dialog



To modify analog output features not available on the Main Screen, click this icon to display the Analog dialog.

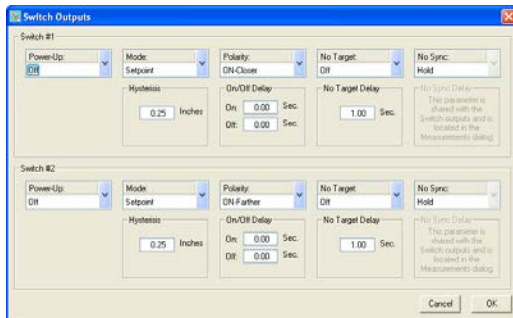


For more information, see the Analog No Target Delay section on page 30.

Switch Dialog



To modify switch output features not available on the Main Screen, click this icon to display the Switch dialog.

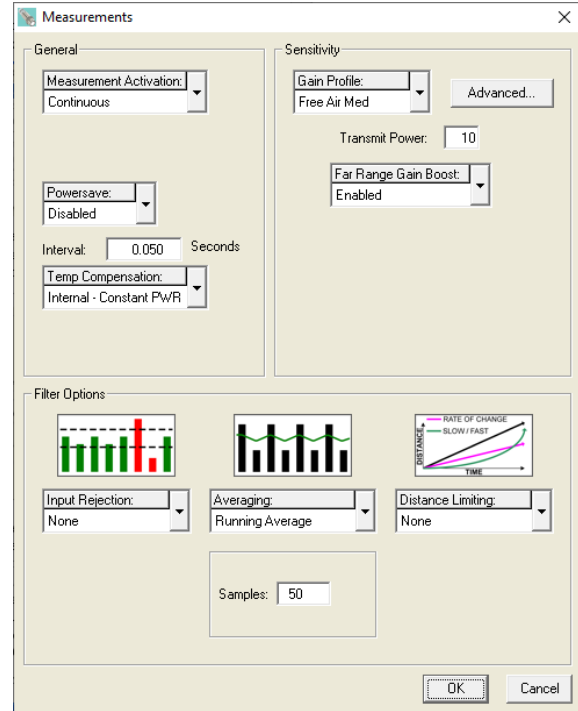


For more information, see the Switch Adjustment section on page 17.

Measure Dialog



To modify measurement parameters not available on the Main Screen, click this icon to display the Measure dialog.



For more information see the Filter section on page 27.

TEACH Enable / Disable



A TEACH button is not included in CHEM sensors and this selection has no effect.

Sensor Adjustment

Sensor setups are made in the workspace then transferred to the sensor. The screen shot below shows the screen with the **Workspace** icon selected.

- (a) Setups can be moved between the Workspace and a disk file or sensor (see page 31).



Setup changes do not take effect until moved to the sensor! *Remember to save setups to disk for future recall.*

- (b) Click one of these ICONS for extended features associated with the analog outputs, switch outputs or measurements.

Wiring adjustments: see page 12.

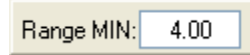
Analog adjustments: see page 14

Switch adjustments: see page 17

Measurement adjustments: see page 34

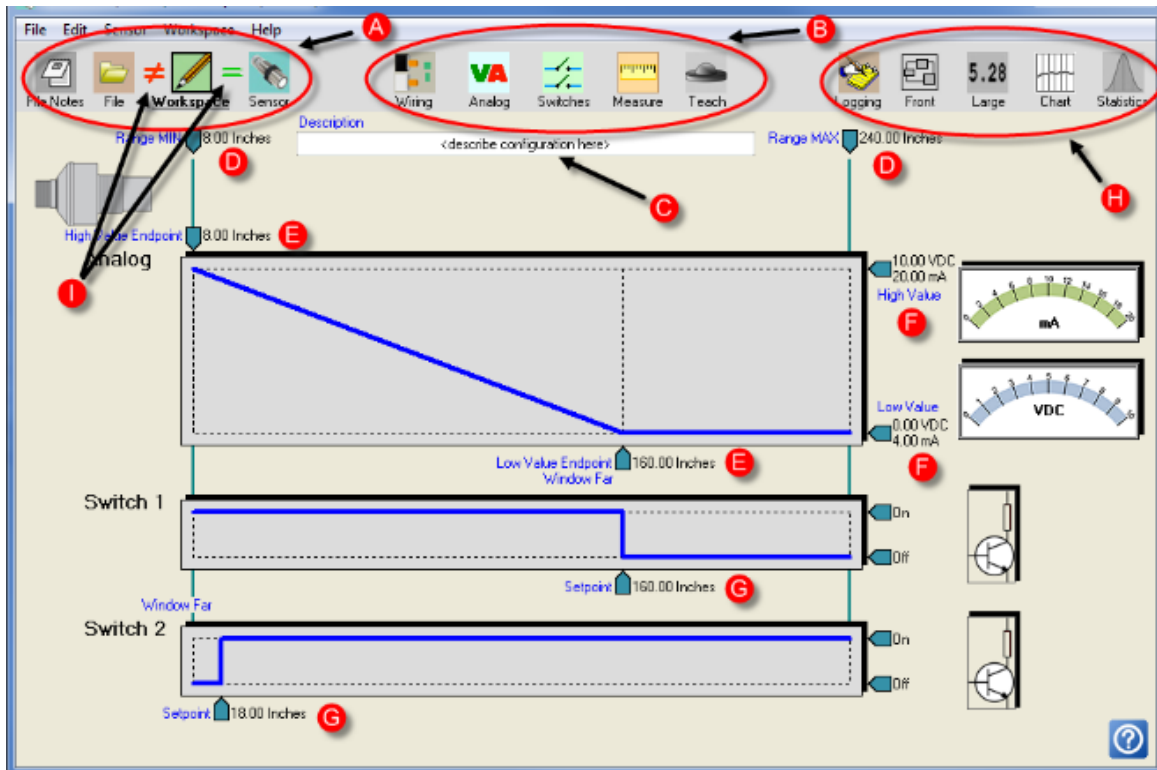
- (c) Enter up to 32 characters to describe a setup. This reminder text is stored in the sensor or disk file when the parameters are moved or saved.
- (d) Click the distance text to edit the *Operating Range* (see page 22). Range MIN is the left

parameter and Range MAX the right, e.g., clicking the 4.00 inch (left) value yields:



Enter a new value then type <Enter>.

- (e) Click the distance text of high and/or low analog endpoints to calibrate the analog outputs. The voltage and current outputs share the endpoints.
- (f) Click text of the high and/or low values to change the output range. The voltage and current loop outputs are independently adjustable.
- (g) Click the distance text of the switch setpoints to calibrate the switch ON distances. Hysteresis and window options are found by clicking the Switches icon (page 17).
- (h) These icons are grayed out in **Workspace** but operate when connected to a sensor (click **Sensor** icon). See Sensor Viewing on page 24.
- (i) Equality symbols indicate whether the Workspace is equal or not to the File and Sensor. Click to see differences or view the entire parameter set for printing.



Appendix A – List of Adjustable Features

These parameters can be changed using Whitman Controls WhitmanVIEW™. Parameters are permanently stored in the sensor memory.

◆ = implied parameters (not directly settable)

Feature	Description	As Shipped from Factory
<p>General Parameters These parameters are available on the WhitmanVIEW Main Screen.</p>		
<i>Description</i>	A 32-character text field to describe the application setup. This serves as a reminder when a setup is retrieved from a sensor or disk file. It is only for reference and does not affect sensor operation.	This text: <describe configuration here>
<i>Range Min</i>	The shortest distance the sensor will provide target measurements. Closer targets may have multiple reflections resulting in an incorrect measurement at a multiple of the actual distance.	See Table 1 page 8
<i>Range Max</i>	The farthest distance the sensor will provide target measurements.	See Table 1 page 8
<i>Operating Range</i> ◆	The range of distances between the <i>Range Min</i> and <i>Range Max</i> , between which the sensor will detect a target. Targets closer than Range Min may still be detected (at incorrect distance) due to multiple reflections.	
<p>Parameters that Affect Measurements These parameters are available by clicking the WhitmanVIEW MEASURE icon.</p>		
<i>Measurement Interval</i> (p 26)	The period between measurements. Values can range from 5 ms to 1.275 sec at 5 ms resolution.	See Table 1 page 8
<i>Temperature Compensation</i> (p 30)	Temperature compensation can be turned ON or OFF	ON
<i>Filters</i> (p 27)	Filter options include Closest or Farthest of M, X of Y, Running or Boxcar average of N, Max Rate and Slow/Fast Rate	All filters OFF
<i>Measurement Activation</i> (p21)	Continuous (at <i>measurement interval</i>) Start on Poll (Measure upon receiving serial data read poll) SYNC Master (continuous at <i>sync interval</i>) SYNC Slave 1, 2, 3, 4 or 5 (at <i>sync interval</i> , measures when receive associated SYNC input from SYNC Master) (<i>sync interval</i> = <i>measurement interval</i> x <i>SYNC phases</i>)	Continuous
<i>SYNC Phases</i>	The number of SYNC phases generated by a SYNC Master (pg. 22)	2
<i>No Sync Delay</i>	The time a SYNC Slave sensor must continuously fail to detect a SYNC input before setting the No SYNC switch state(s) or analog value(s). Values: 0 ms to 5.46 minutes (resolution 5 ms)	0 ms
<i>PowerSave</i>	PowerSave reduces average power consumption. Options: Enabled and Disabled .	Disabled

**Parameters that Affect Switch Outputs
(if selected)**

Setpoints are available on the WhitmanVIEW Main Screen, other parameters by clicking the **Switches** icon.

<p><i>Switch Output Selection</i></p>	<p>There are two switch outputs (see page 33). The factory default is both switches configured as sinking (NPN) outputs. Switch #1 is on the BLACK wire. Switch #2 is on the WHITE wire. Switches are configurable as sinking (NPN) or sourcing (PNP) type. If both are selected they each are independently adjustable.</p>	<p>Reconfigure switch type menu selection Sensor - Wiring</p>
<p>Green arrows indicate switch state (and associated green indicator) are ON.</p>		
<p><i>Switch Mode</i></p>	<p>Hysteresis: Switch turns ON at the <i>Setpoint</i> and OFF after the distance reverses direction by at least <i>Hysteresis</i> Window: The Switch State is set in a distance window beginning at <i>Setpoint</i> and ending at <i>Setpoint</i> + <i>Width</i> from the sensor Options: Setpoint or Window</p>	<p>SW #1:Setpoint SW #2:Setpoint</p>
<p><i>Power-Up State</i></p>	<p>The switch state set when power is first applied. This state remains until completion of the first <i>Measurement Cycle</i> or <i>Measurement Process</i>. Options: ON and OFF</p>	<p>SW #1: OFF SW #2: OFF</p>
<p><i>Setpoint</i></p>	<p>The distance where a switch changes from OFF to ON.</p>	<p>See Table 1 page 8</p>
<p><i>Polarity</i></p>	<p>If Switch Mode = Hyst: Direction of target through Setpoint causing ON Options: On Closer or ON Farther If Switch Mode = Wind: Switch state when target is detected in window Options: ON or OFF</p>	<p>SW #1: ON Closer SW #2: ON Farther</p>

ToughSonic® CHEM Family Sensors – Installation & Operating Instructions

<i>No Target State</i>	Switch action if no target is detected (TARGET LED = RED) for a time period exceeding the switch's No Target Delay. Options: ON , OFF and HOLD (no change)	SW #1: OFF SW #2: OFF
<i>No Target Delay</i>	The minimum time the sensor must continuously fail to detect a target before setting the No Target State Values: 5 ms to 5.46 minutes (resolution 5 ms)	SW #1: 0 ms SW #2: 0 ms
<i>Hysteresis or Width</i>	A distance value representing either the amount of Hysteresis (Setpoint Mode) or the length of the Window (Window Mode) Values: 0 to 221.77 in. (5.63 m) <i>(Warning if result surpasses Range Window for selected Switch Mode)</i>	SW #1: 0.25 in. (6.4 mm) SW #2: 0.25 in. (6.4 mm)
<i>On Delay</i>	The minimum time the sensor must continuously measure a distance representing an ON condition before setting the Switch State to ON Values: 0 ms to 5.46 minutes (resolution 5 ms)	SW #1: 0 ms SW #2: 0 ms
<i>Off Delay</i>	The minimum time the sensor must continuously measure a distance representing an OFF condition before setting the Switch State to OFF. Values: 0 ms to 5.46 minutes (resolution 5 ms)	SW #1: 0 ms SW #2: 0 ms
<i>No Sync State</i>	Switch state set by a SYNC Slave sensor with no master SYNC input for a period exceeding <i>No Sync Delay</i> . Options: ON , OFF and HOLD (no change)	SW #1: OFF SW #2: OFF
<i>No Sync Delay</i>	See description under <i>Parameters that Affect Measurements</i> . This parameter is shared by all analog and switch outputs.	0 ms

Feature	Description	As Shipped from Factory
<p>Parameters that Affect Analog Outputs (if selected)</p> <p>Endpoints are available on the WhitmanVIEW Main Screen, other parameters by clicking the <u>Analog</u> icon.</p>		
<p style="text-align: center;">Decreasing Analog Slope Increasing Analog Slope</p>		
<p>Analog Selections</p>	<p>There are three analog outputs (see page 13) on these wires. Voltage output is on the VIOLET wire. 4-20 mA current SOURCING output is on the GREEN wire. 4-20 mA current SINKING output is on the ORANGE wire. Note: The voltage and current share the same Analog Window, Analog Slope, No-Target Delay and No Sync Delay.</p>	
<p>Analog Window (analog shared)</p> <p>◆</p>	<p>The range of distances between the Low Endpoint and High Endpoint, between which the voltage and current outputs are linearly scaled to change between their Low Values and High Values respectively.</p>	<p>Between the <i>endpoints</i> listed below</p>
<p>Analog Slope (analog shared)</p> <p>◆</p>	<p>The analog slope either increases or decreases with distance depending on the relative positions of the Low Endpoint and High Endpoint. The current and voltage must have the same slope. The voltage min and max values must be separated by at least 0.1 VDC. The current min and max values must be separated by at least 0.2 mA.</p>	<p>Increasing</p>
<p>Low Endpoint (analog shared)</p>	<p>One end of the range of distances over which the analog outputs are scaled. At the Low Endpoint distance the outputs are the Low Voltage Value and/or Low Current Value. If this distance is outside the sensor's Operating Range the value will not be reached but the sensor operates properly for in-range targets.</p>	<p>See Table 1 page 8</p>
<p>High Endpoint (analog shared)</p>	<p>One end of the range of distances over which the analog outputs are scaled. At the High Endpoint distance the outputs are the High Voltage Value and/or High Current Value. If this distance is outside the sensor's Operating Range the value will never be reached but the sensor operates properly for in-range targets.</p>	<p>See Table 1 page 8</p>

ToughSonic® CHEM Family Sensors – Installation & Operating Instructions

<i>High Voltage Value</i>	<p>Voltage output for targets detected at the <i>High Endpoint</i> (and outside the <i>High Endpoint</i> side of the analog range)</p> <p>Either the standard default 10 VDC or a custom value can be entered.</p> <p>Values: 0.1 to 10 VDC in 50 mV steps</p> <p>Value must be at least 1.0 volts above the <i>Low Voltage Value</i>.</p>	10 VDC
<i>Low Voltage Value</i>	<p>Voltage output for targets detected at the <i>Low Endpoint</i> (and outside the <i>Low Endpoint</i> side of the analog range)</p> <p>Either the standard default 0 VDC or a custom value can be entered.</p> <p>Values: 0 VDC to 9.9 VDC in 50 mV steps</p> <p>Value must be at least 1.0 volts below the <i>High Voltage Value</i>.</p>	0 VDC
<i>High Current Value</i>	<p>Current output for targets detected at the <i>High Endpoint</i> distance (and outside the <i>High Endpoint</i> side of the analog range)</p> <p>Either the standard default 20 mA or a custom value can be entered.</p> <p>Values: 2.2 to 20 mA in 0.1 mA steps</p> <p>Value must be at least 2.0 mA above the <i>Low Current Value</i>.</p>	20 mA
<i>Low Current Value</i>	<p>Current output for targets detected at the <i>Low Endpoint</i> distance (and outside the <i>Low Endpoint</i> side of the analog range)</p> <p>Either the standard default 4 mA or a custom value can be entered.</p> <p>Values: 2 mA to 19.9 mA in 0.1 ma steps</p> <p>Value must be at least 2.0 mA below the <i>High Current Value</i>.</p>	4 mA
<i>Power-Up Voltage</i>	<p>The voltage output value set when power is first applied; remains until completion of the first <i>Measurement Cycle</i> or <i>Measurement Process</i>.</p> <p>Options: LOW or HIGH analog output value</p> <p>Voltage goes to <i>Low Voltage Value</i> or <i>High Voltage Value</i>.</p>	LOW
<i>Power-Up Current</i>	<p>Current loop output value set when power is first applied; remains until completion of the first <i>Measurement Cycle</i> or <i>Measurement Process</i>.</p> <p>Options: LOW or HIGH analog output value</p> <p>Current goes to <i>Low Current Value</i> or <i>High Current Value</i>.</p>	LOW
<i>No Target Voltage</i>	<p>Voltage value if no target is detected (TARGET LED = RED) for a time period exceeding the analog <i>No Target Delay</i>.</p> <p>Options: LOW, HIGH, and HOLD (no change)</p>	HOLD
<i>No Target Current</i>	<p>Current loop output value if no target is detected (TARGET LED = RED) for a time period exceeding the analog <i>No Target Delay</i>.</p> <p>Options: LOW, HIGH, and HOLD (no change)</p>	HOLD
<i>No-Target Delay (shared)</i>	<p>The minimum time the sensor must continuously fail to detect a target before setting the No Target Value.</p> <p>Values: 0 ms to 5.46 minutes (resolution 5 ms)</p>	0 ms
<i>No Sync Voltage</i>	<p>Voltage value set by a SYNC Slave sensor with no master SYNC input for a period exceeding <i>No Sync Delay</i>.</p> <p>Options: LOW, HIGH, and HOLD (no change)</p>	HOLD
<i>No Sync Current</i>	<p>Current loop value set by a SYNC Slave with no master SYNC input for a period exceeding <i>No Sync Delay</i>.</p> <p>Options: LOW, HIGH, and HOLD (no change)</p>	HOLD
<i>No Sync Delay (analog shared)</i>	<p>See description under <i>Parameters that Affect Measurements</i>. This parameter is shared by all analog and switch outputs.</p>	0 ms
<i>(analog shared)</i>	Indicates parameter applies to all current loop and voltage outputs.	