LIQUID LEVEL SWITCHES – Selection Guide

This document provides an overview of SST Sensing's liquid level switches; you will find information regarding important features such as housing and thread types, dimensions, working voltages and best suited applications of particular switch types.

NOTE: This document is not intended to replace the product datasheets which are referenced within. For ordering information and detailed specifications please refer to the datasheets or contact sales@sstsensing.com.

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1 THINGS TO CONSIDER

Optical liquid level switches do not measure the liquid level, instead they detect the presence or absence of liquid.

There are a number of things to consider when choosing a liquid level switch:

Mounting position; where the switch is to be mounted can narrow the selection field, for example, is space a restrictive factor?

Application; where the switch is to be used can narrow the selection field:

- Food or beverage application?
- Medical or chemical handling?

Environmental factors; the environment in which your switch will be working has a direct bearing on the material type you should select. Fluid type and temperature are key factors; for example, is the liquid corrosive; high or low temperature?

SST offers three housing material options depending on switch type; Polysulfone, Trogamid® (EU food-contact grade) or stainless steel.

Again, depending on switch type, SST offers three tip material options; Polysulfone, Trogamid® (EU food-contact grade) or glass.

NOTE: If you need a switch other than those listed in this document, contact SST Sensing; we will be happy to discuss your requirements.

Refer to *AN-0041, Liquid Level Switches – Installation, Operation and Compatibility Guide* for a list of compatible fluids. These lists are not exhaustive, SST recommends testing a sample sensor in the fluid you intend operating in, refer to *AN-0041* for details of the test procedure.

NOTE: Typical applications are listed throughout this document; they are given as examples only; they are NOT the only applications in which the switches operate. Contact SST Sensing if you require assistance identifying the most suitable switch to suit your needs.

Figure 1-1 Leak Detection

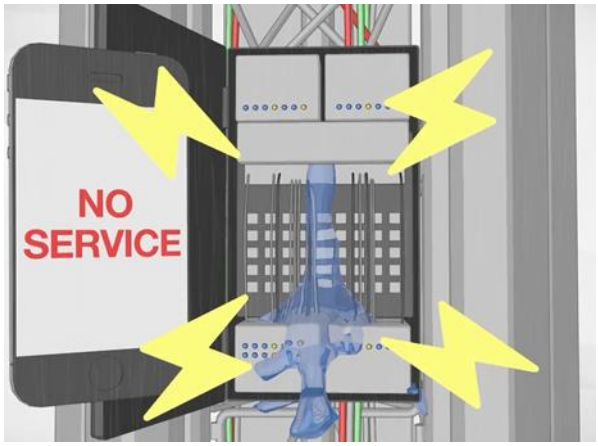
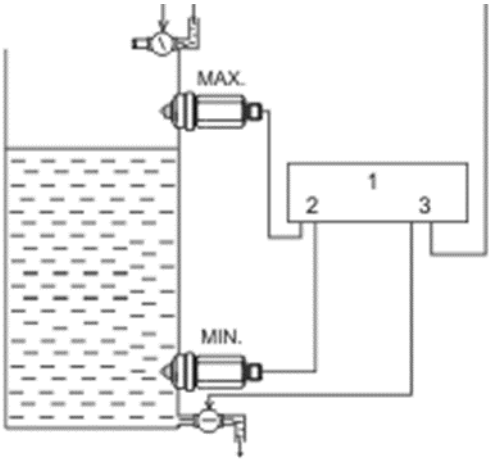
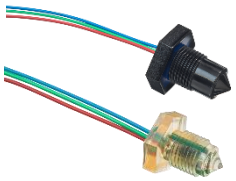


Figure 1-2 Low / High Level Indication



2 SWITCH TYPES

There are six switch ranges within the liquid level family; Optomax Digital, Optomax Industrial, Optomax Industrial Glass, LLHP, POS and Optomax Basic. The following gives a brief overview of the switch, refer to 3 SPECIFICATIONS starting on page 3-1 for further details:



2.1 Optomax Digital Range

Operating voltage: 4.5V to 15.4V_{DC}

Operating temperature range: -25°C to + 80°C or -40°C to +125°C

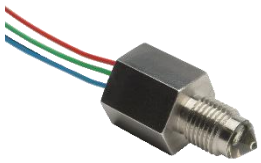
Typical applications: Best suited for low power signalling of liquid presence/absence.

2.2 Optomax Industrial Range

Operating voltage: 4.5V to 15.4V_{DC} or 8V to 30V_{DC}

Operating temperature range: -25°C to + 80°C or -40°C to +125°C

Typical applications: Designed where high power signalling of liquid presence/absence is required, or, operation at higher (industrial) voltages. Industrial range switches are capable of driving high power loads, and are able to (depending on output type) sink/source up to 1A.



2.3 Optomax Industrial Glass Range

Operating voltage: 4.5V to 15.4V_{DC} or 8V to 30V_{DC}

Operating temperature range: -25°C to + 80°C or -40°C to +125°C

Typical applications: All the technical capabilities of the Optomax Industrial Range with the added benefits of a stainless steel housing and glass sensing tip, allowing the sensor to be used in harsh chemical environments.

2.4 LLHP (High Performance) Range

Operating voltage: 4.5V to 15.4V_{DC} or 10V to 45V_{DC}

Operating temperature range: -25°C to + 80°C or -40°C to +125°C

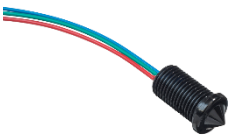
Typical applications: Comes in a rugged metal housing, designed for aggressive environments. Capable of withstanding high and low temperatures and with options for high switching currents. They have multiple output configurations and several thread types available, or, if required can be supplied with a custom thread type.

2.5 POS Range

Operating voltage: 12V to 28V_{DC}

Operating temperature range: -25°C to 100°C or -40°C to + 140°C

Typical applications: With its stainless steel housing and Simax crystal glass sensing tip, the POS range is ideally suited for use in harsh chemical environments.



2.6 Optomax Basic Range

Operating voltage: 3.3V to 24V_{DC}

Operating temperature range: -25°C to + 80°C

Typical applications: Designed primarily with price sensitive high volume OEM applications in mind, for example white goods, vending machines, and automotive applications. Requires a clean, protected, and stable power supply and an available microcontroller, or other circuit, to determine whether the sensor is in air or liquid based on its analogue output voltage.

NOTE: Power supply and microcontroller not supplied with the switch.

3 SPECIFICATIONS

The following section provides high-level switch specifications; for full details, refer to the product datasheet (see REFERENCE DOCUMENTS for details).

3.1 Optomax Digital Range

For full specification details, refer to the datasheet.

3.1.1 Mounting and Housing Types

Housing Series	5x0 Series	2x0 Series	6x0 Series	7x0 Series
Thread	M10x1	M12x1x8g with hex nut[a]	½" SAE with O-ring[a]	¼" NPT
Tightening Torque	1.5 Nm / 13.26 in-lbs maximum			
Pressure[b]	20 bar / 290 psi maximum	7 bar / 101 psi maximum		
Mounting Hole	Ø10mm	Ø12mm	Ø1/2 inch	Ø1/4 inch NPT threaded
Housing Material	Polysulfone or Trogamid®			
Termination	24AWG, 250 mm PTFE wires, 8 mm tinned			

3.1.2 Product Dimensions

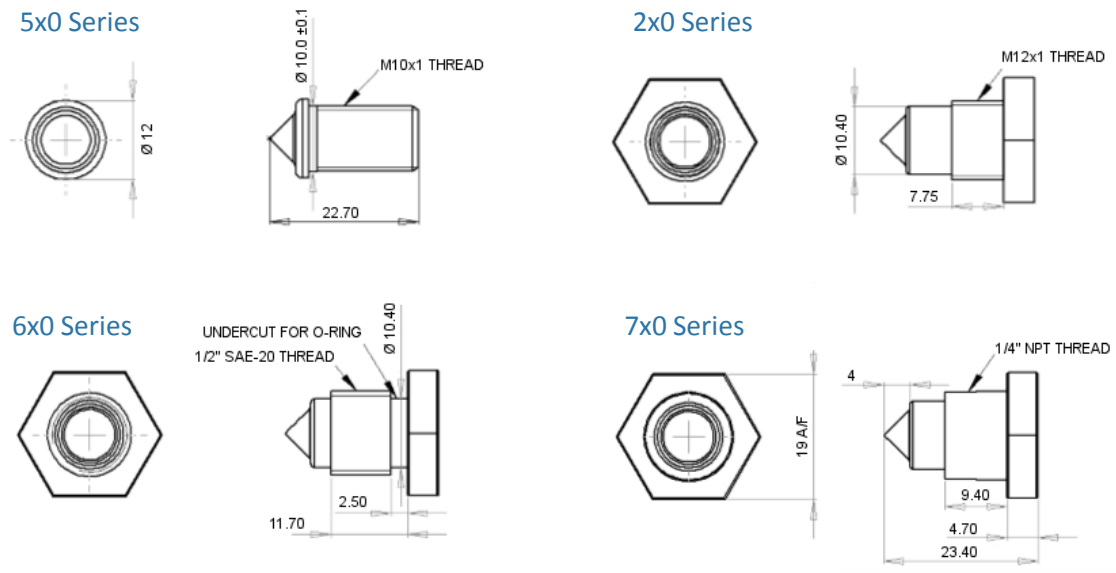


Figure 3-1 Product Dimensions – Optomax Digital Range

[a] Hex nut and O-ring sold separately.
[b] When correctly sealed.

3.1.3 Circuit Diagrams

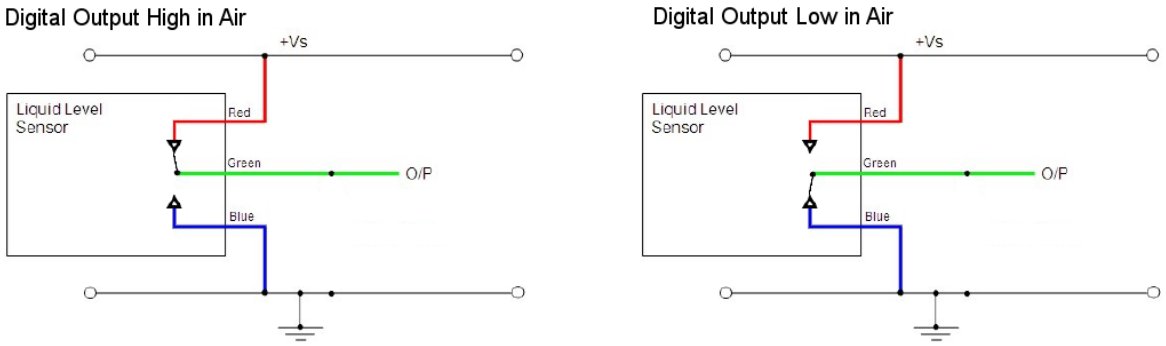


Figure 3-2 Circuit Diagrams - Optomax Digital Range

3.2 Optomax Industrial Range

For full specification details, refer to the datasheet.

3.2.1 Mounting and Housing Types

Housing Series	2x0 Series	6x0 Series	7x0 Series
Thread	M12x1x8g with hex nut[c]	½" SAE with O-ring[c]	¼" NPT
Tightening Torque	1.5 Nm / 13.26 in-lbs maximum		
Pressure[d]	7 bar / 101 psi maximum		
Mounting Hole	Ø12mm	Ø1/2 inch	Ø1/4 inch NPT threaded
Housing Material	Polysulfone or Trogamid®		
Termination	20AWG, 250 mm PTFE wires, 8 mm tinned		

3.2.2 Product Dimensions

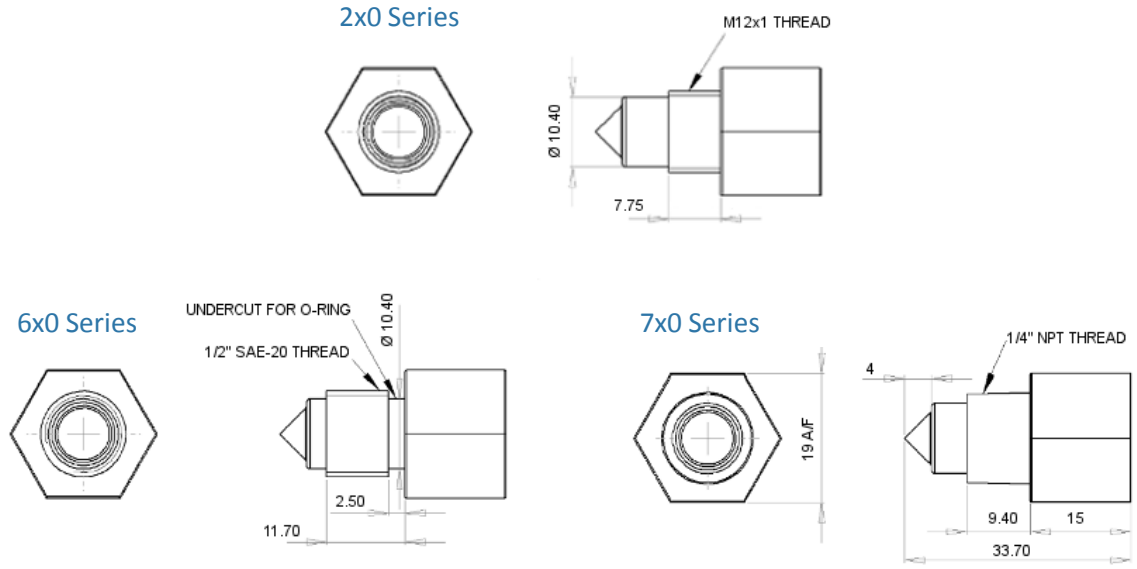


Figure 3-3 Product Dimensions – Optomax Industrial Range

[c] Hex nut and O-ring sold separately.
[d] When correctly sealed.

3.2.3 Circuit Diagrams

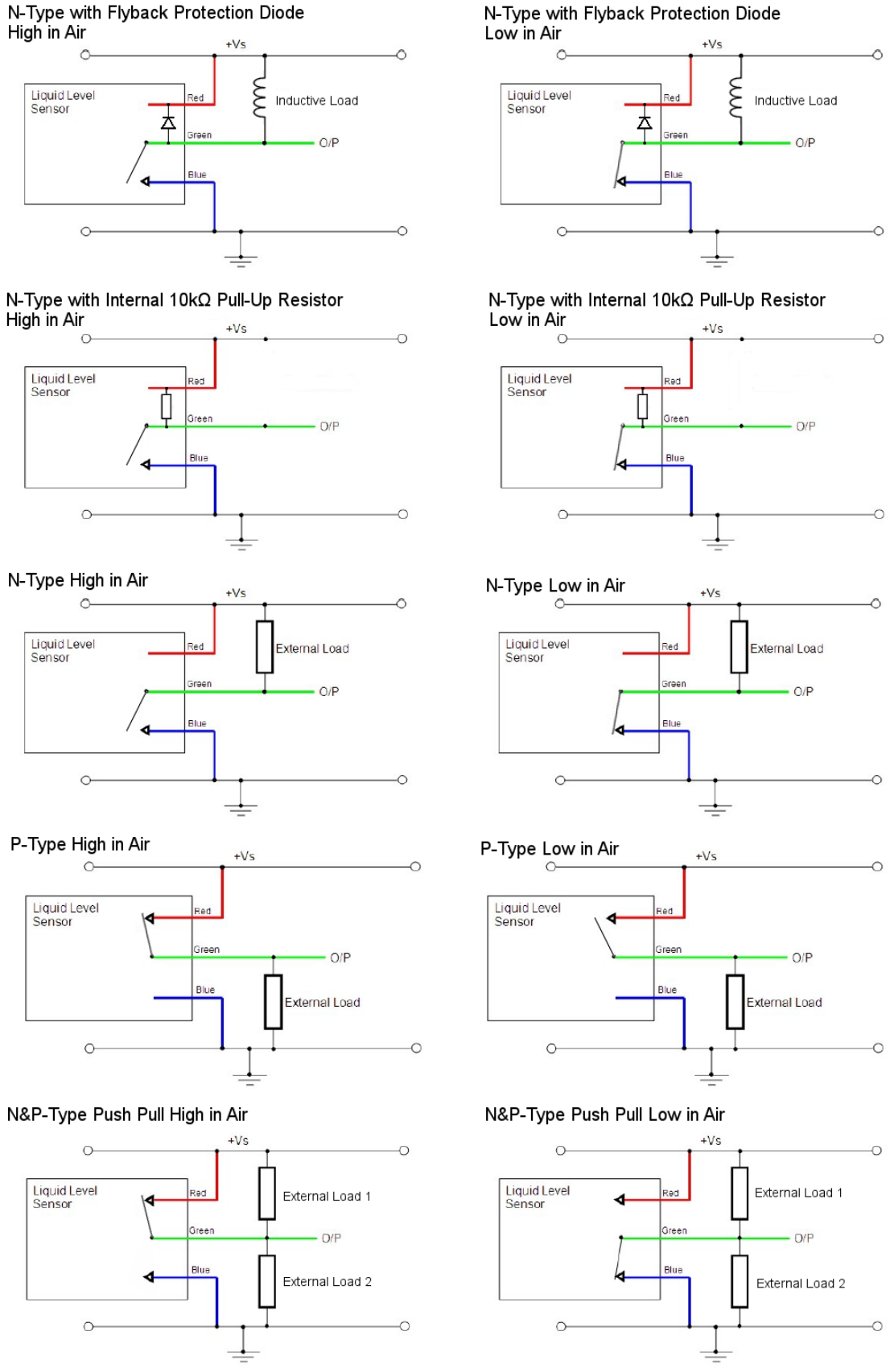


Figure 3-4 Circuit Diagrams - Optomax Industrial Range

3.3 Optomax Industrial Glass Range

For full specification details, refer to the datasheet.

3.3.1 Mounting and Housing Types

Housing Series	G2x0 Series	G6x0 Series	G7x0 Series	G8x0 Series
Thread	M12x1x8g with hex nut[e]	½" SAE with O-ring[e]	¼" NPT	½" NPT
Tightening Torque[f]	3 Nm / 26.5 in-lbs maximum			
Pressure[g]	100 bar / 1450 psi maximum			600 bar / 8702 psi max.
Housing Material	Stainless steel housing with glass tip			
Termination	20AWG, 250 mm PTFE wires, 8 mm tinned			

3.3.2 Product Dimensions

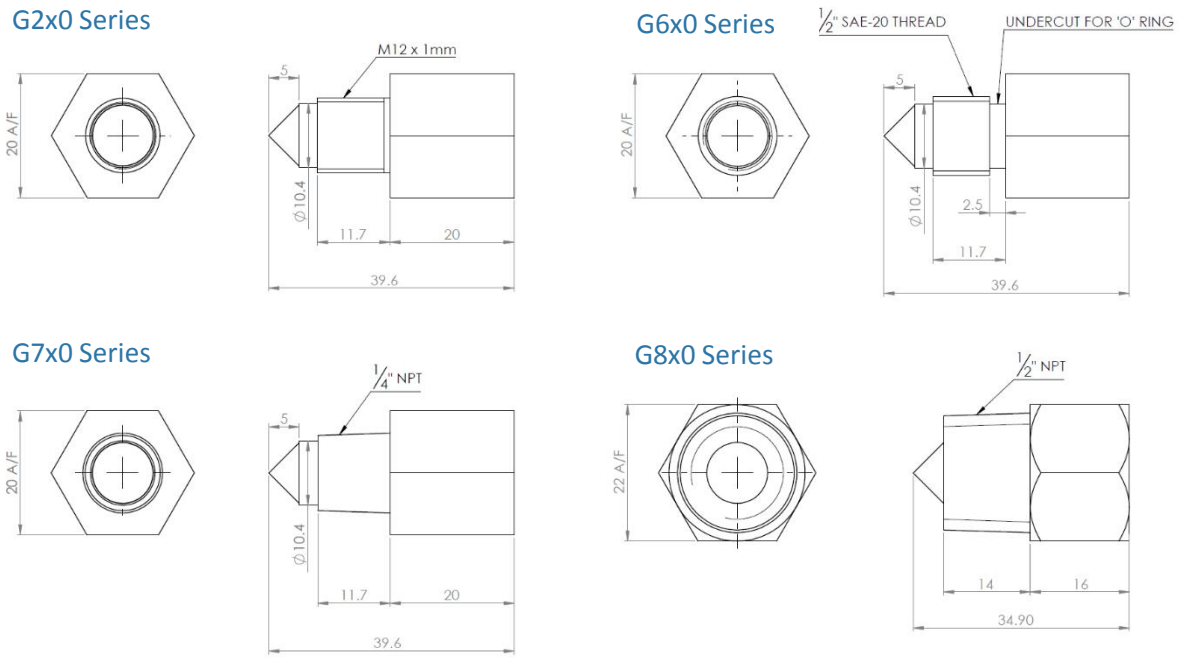


Figure 3-5 Product Dimensions – Optomax Industrial Glass Range

[e] Hex nut and O-ring sold separately.
[f] Do NOT over-tighten as this can permanently damage the sensor.
[g] When correctly sealed.

3.3.3 Circuit Diagrams

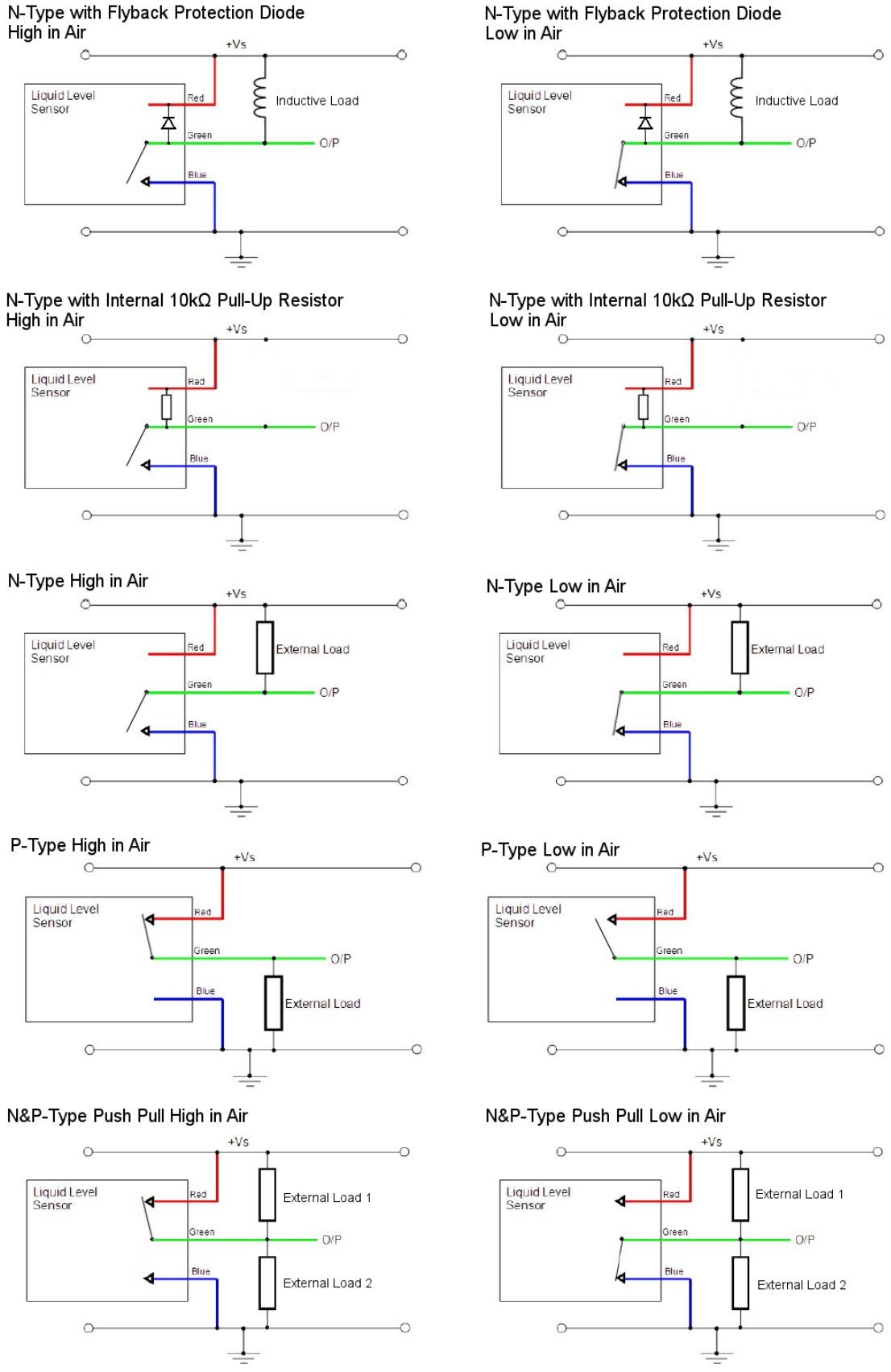


Figure 3-6 Circuit Diagrams – Optomax Industrial Glass Range

3.4 LLHP (High Performance) Range

For full specification details, refer to the datasheet.

3.4.1 Mounting and Housing Types

Housing Series	2 Series	5 Series	8 Series	B Series
Thread	½" BSP	3/8" BSP	½" NPT	¾" – 16 UNJF
Pressure[h]	25 bar / 363 psi maximum			
Housing Material	Stainless steel housing with Polysulfone tip			
Termination	Various; refer to datasheet for details			

3.4.2 Product Dimensions

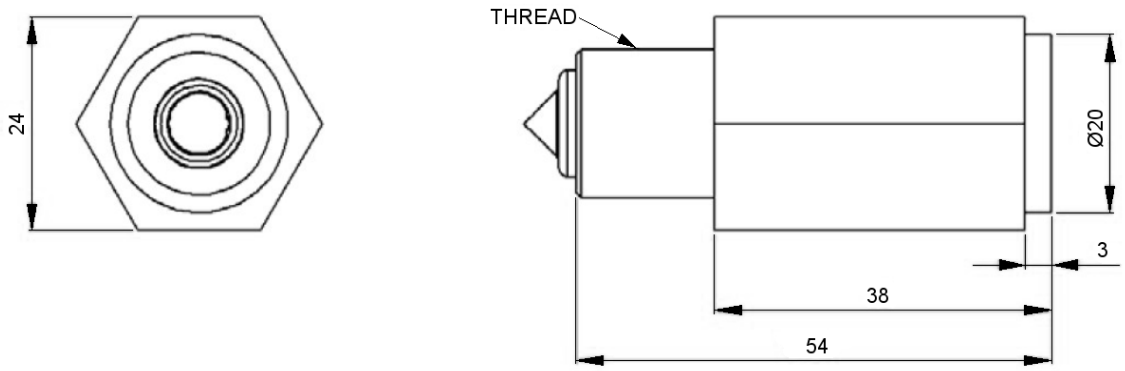


Figure 3-7 Product Dimensions – LLHP Range

[h] When correctly sealed.

3.4.3 Circuit Diagrams

4.5V – 15.4V$_{DC}$

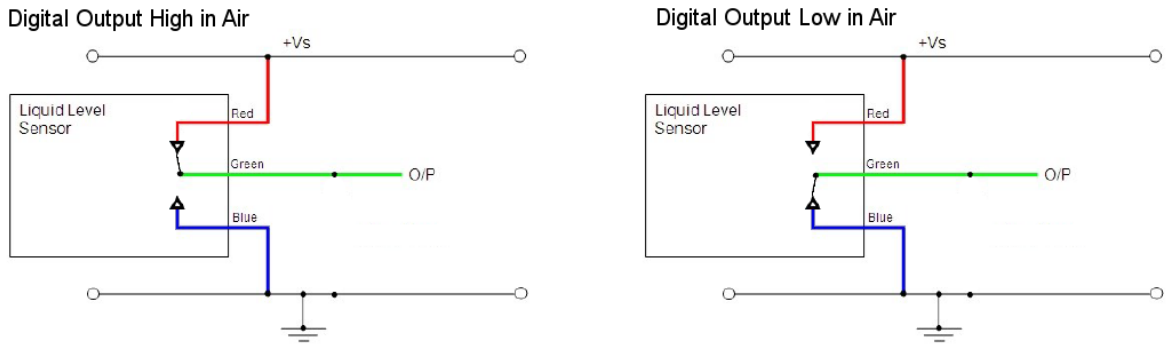


Figure 3-8 Circuit Diagrams - LLHP Range; 4.5V – 15.4V$_{DC}$

10V – 45V$_{DC}$

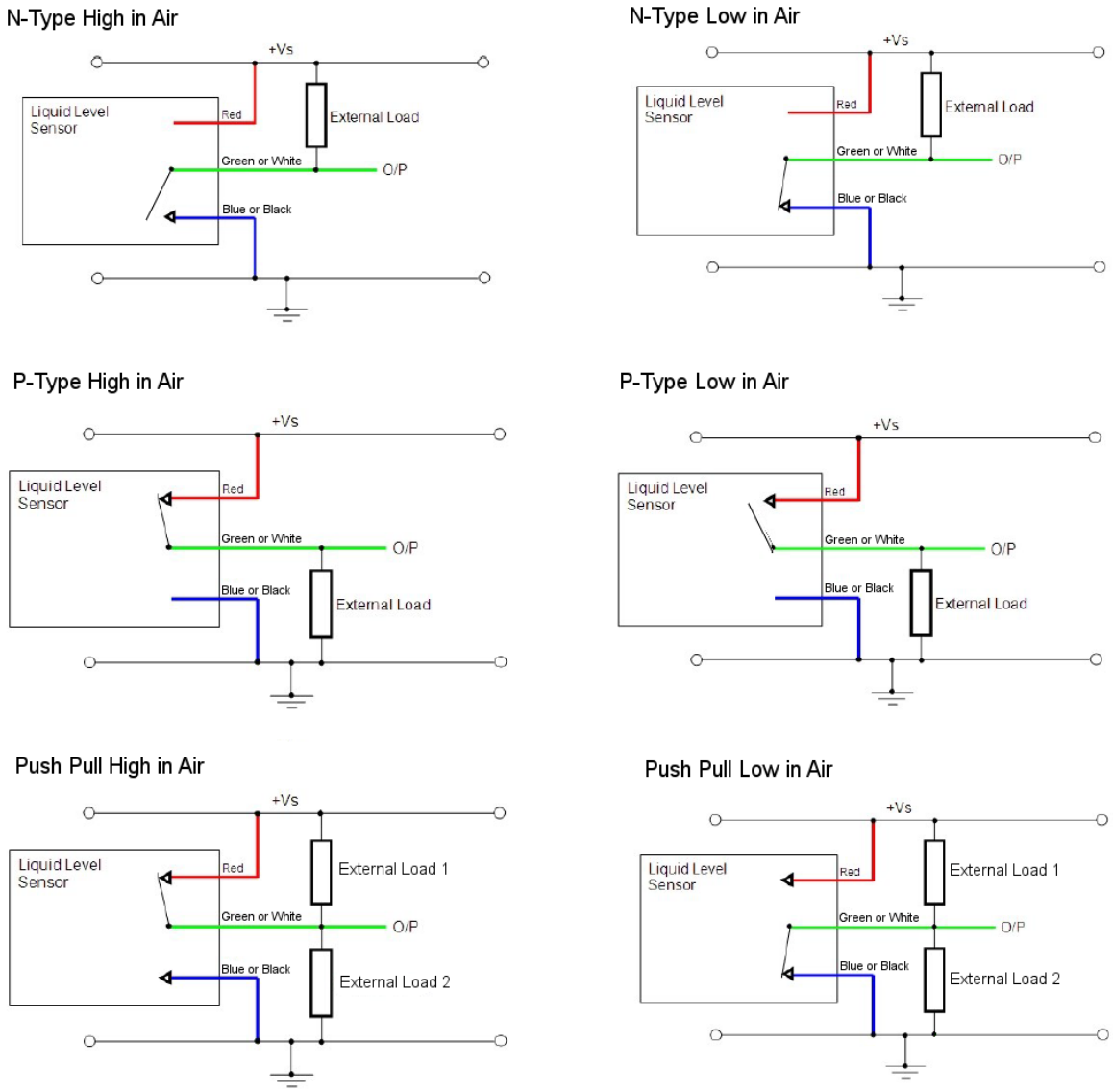


Figure 3-9 Circuit Diagrams - LLHP Range; 10V – 45V$_{DC}$

3.5 POS Range

For full specification details, refer to the datasheet.

3.5.1 Mounting and Housing Types

Housing Series	POS187	POS287
Thread	G1/2" (1/2" BSPP)	
Pressure[i]	80 bar / 1160 psi maximum	
Housing Material	Stainless steel housing with Simax crystal tip	
Termination	Cable; PUR 3x0.25mm^2, 2m long (IP68)	
	M12x1 Brad Harrison micro (IP67)	

3.5.2 Product Dimensions

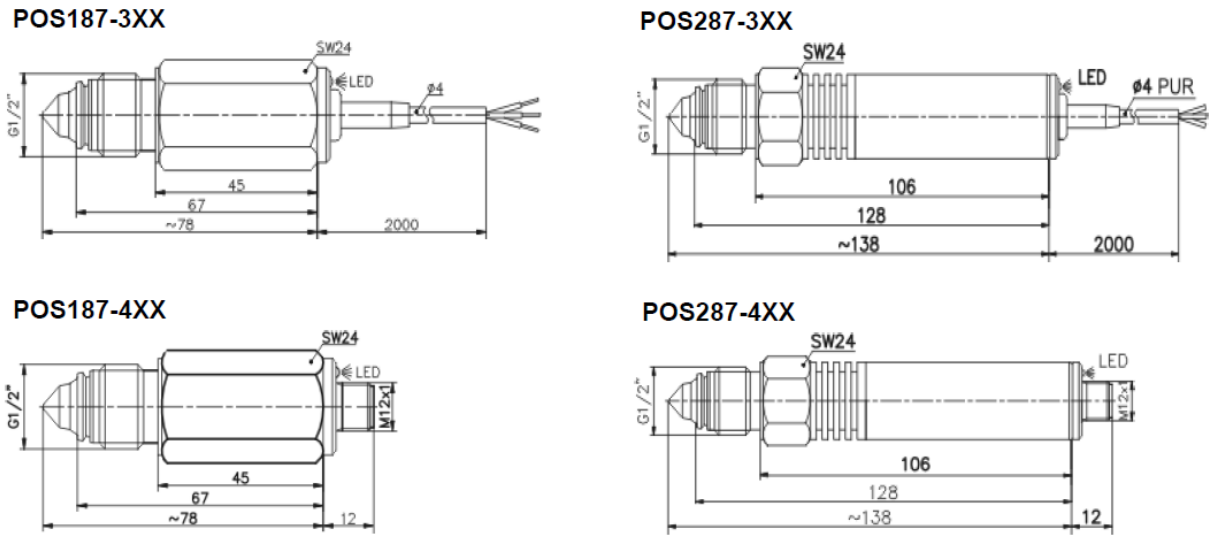


Figure 3-10 Product Dimensions – POS Range

[i] When correctly sealed.

3.5.3 Circuit Diagrams

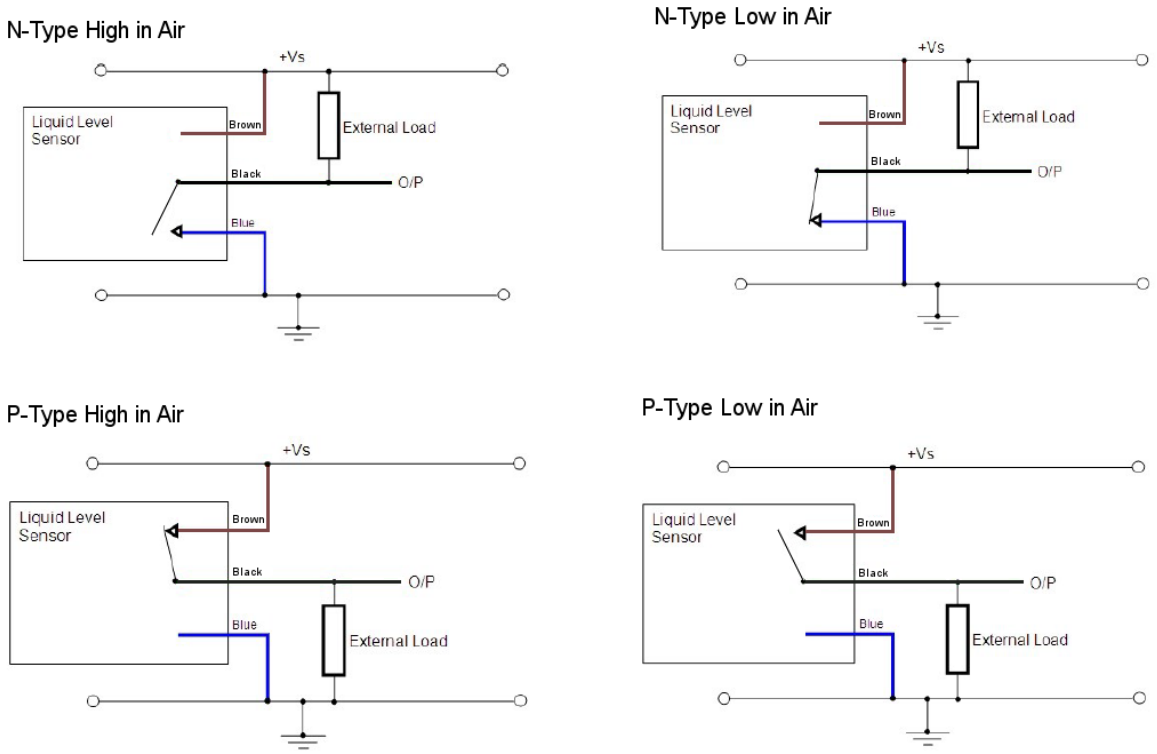


Figure 3-11 Circuit Diagrams - POS Range

3.6 Optomax Basic Range

For full specification details, refer to the datasheet.

3.6.1 Mounting and Housing Types

Housing Series	500 Series	200 Series	600 Series	700 Series
Thread	M10x1	M12x1x8g with hex nut[j]	½" SAE with O-ring[j]	¼" NPT
Tightening Torque	1.5 Nm / 13.26 in-lbs maximum			
Pressure[k]	20 bar / 290 psi maximum	7 bar / 101 bar maximum		
Mounting Hole	Ø10mm	Ø12mm	Ø1/2 inch	Ø1/4 inch NPT threaded
Housing Material	Polysulfone or Trogamid®			
Termination	24AWG, 250 mm PTFE wires, 8 mm tinned			

3.6.2 Product Dimensions

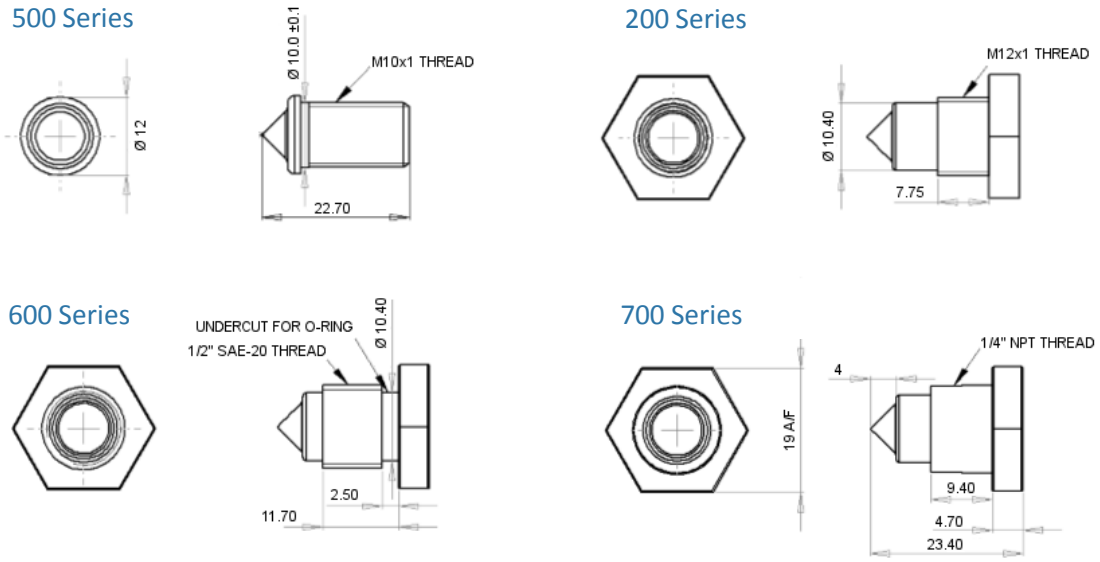


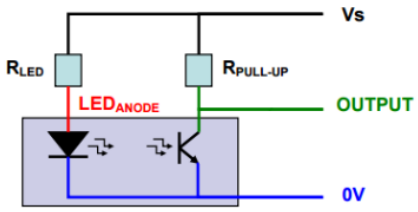
Figure 3-12 Product Dimensions – Optomax Basic Range

[j] Hex nut and O-ring sold separately.
[k] When correctly sealed.

3.6.3 Circuit Diagrams

Three and four wire options are available. Refer to the datasheet for details on R_{LED} and $R_{PULL-UP}$ resistor calculations.

3-wire version



4-wire version

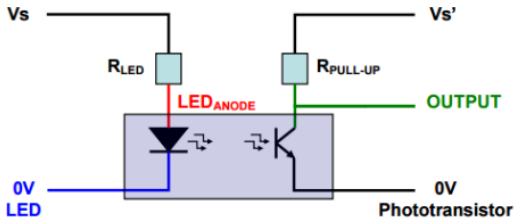


Figure 3-13 Circuit Diagrams - Basic Range

NOTE: The 4-wire version provides galvanic isolation between input (IR-LED) and output (phototransistor).

APPENDIX A – SWITCH QUICK COMPARISON TABLE

The following table provides a quick comparison of the switch's key attributes:

Part Number Convention		LLX5X0D3X	LLXXX0D3XSH	LLXXX0D3XXX-XXX	LLGXX0D3XXX-XXX	LLHPXXXXXX	POSX87XXX-XXX	LLX500AX	LLXX00AXSH
Type	*Digital*	✓	✓						
	Industrial			✓					
	Industrial Glass				✓				
	HP					✓			
	POS						✓		
	Basic							✓	✓
Housing Material	*Polysulfone*	✓	✓	✓				✓	✓
	Trogamid®	✓	✓	✓				✓	✓
	Stainless Steel				✓	✓	✓		
Thread Type	*M10*	✓						✓	
	M12		✓	✓	✓				✓
	½" SAE		✓	✓	✓				✓
	¼" NPT		✓	✓	✓				✓
	½" NPT			✓	✓	✓			
	3/8" BSP					✓			
	½" BSP					✓			
	(G½") ½" BSPP						✓		
	¾"-16 UNJF					✓			
Operating Temp.	*-25°C to +80°C*	✓	✓	✓	✓	✓		✓	✓
	-25°C to +100°C						✓		
	-40°C to +125°C	✓	✓	✓	✓	✓			
	-40°C to +140°C						✓		
Supply Voltage	*4.5 to 15.4V*	✓	✓	✓	✓	✓			
	12 to 28V						✓		
	8 to 30V			✓	✓				
	10 to 45V					✓			
	3.3 to 24V[l]							✓	✓
Output Type	*Phototransistor*[m]							✓	✓
	Push Pull	✓	✓	✓	✓	✓			
	P-Type			✓	✓	✓	✓		
	N-Type			✓	✓	✓	✓		
	N-Type (fly back)			✓	✓				
	N-Type (10Ω pull-up)			✓	✓				
Output Logic	*Low in Air*	✓	✓	✓	✓	✓	✓		
	High in Air	✓	✓	✓	✓	✓	✓		
	PWM	✓	✓						

Key: ✓: Standard | ✓: Customer provides

[l] Any with suitable LED current limiting resistor.

[m] Phototransistor open collector. Refer to circuit diagrams on page 3-12.

REFERENCE DOCUMENTS

Other documents in the liquid level product range are listed below; this list is not exhaustive, always refer to the SST website for the latest information:

Part Number	Title
AN-0041	Liquid Level Switches – Installation, Operation and Compatibility Guide
DS-0031	Liquid Level Switches – Optomax Basic Series – Datasheet
DS-0032	Liquid Level Switches – Optomax Digital Series – Datasheet
DS-0034	Liquid Level Switches – Optomax Industrial Series – Datasheet
DS-0035	Liquid Level Switches – POS Series – Datasheet
DS-0037	Liquid Level Switches – High Performance (HP) Series – Datasheet
DS-0130	Liquid Level Switches – Optomax Industrial Glass Series – Datasheet

CAUTION

Do not exceed maximum ratings and ensure sensor(s) are operated in accordance with their requirements.
Carefully follow all wiring instructions. Incorrect wiring can cause permanent damage to the device.
SST Sensing Ltd recommend using alcohol based cleaning agents. DO NOT use chlorinated solvents such as trichloroethane as these are likely to attack the sensor material.

Failure to comply with these instructions may result in product damage.

INFORMATION

As customer applications are outside of SST Sensing Ltd.'s control, the information provided is given without legal responsibility. Customers should test under their own conditions to ensure that the equipment is suitable for their intended application. Before use, check that the fluid in which you wish to use these devices is compatible with Polysulfone, Trogamid® or Stainless Steel.

For technical assistance or advice, please email: technical@sstsensing.com

General Note: SST Sensing Ltd. reserves the right to make changes to product specifications without notice or liability. All information is subject to SST Sensing Ltd.'s own data and considered accurate at time of going to print.

SST SENSING LIMITED, 5 HAGMILL CRESCENT, SHAWHEAD INDUSTRIAL ESTATE, COATBRIDGE, UK, ML5 4NS
www.sstsensing.com | e: sales@sstsensing.com | t: +44 (0)1236 459 020 | f: +44 (0)1236 459 026

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