

ULS-100

Universal Level Sensor

Data Sheet No. 262485 Rev. B



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1. About This Document

1.1 Function

This instruction provides the information required for mounting, connection, setup, maintenance, and resolving faults. Please read this information before installing the sensor and putting the instrument into operation and keep this manual accessible. All performance characteristics within this document are at a set of standard conditions, and user experience may differ depending on varying application conditions.

1.2 Target group

This operating instruction manual is directed for trained personnel. Only properly trained staff should install and/or repair this product.

1.3 Document Online Location

<https://www.gemssensors.com/docs/default-source/resource-files/product-manual/uls-100-data-sheet>



1.4 Symbols Used



INFORMATION, NOTE, TIP:

This symbol indicates helpful additional information and tips for successful work.



NOTE:

This symbol indicates notes to prevent failures, malfunctions, damage to devices or plants.



CAUTION:

Non-observance of the information marked with this symbol may result in personal injury.



WARNING:

Non-observance of the information marked with this symbol may result in serious or fatal personal injury.



DANGER:

Non-observance of the information marked with this symbol results in serious or fatal personal injury.



EX APPLICATIONS:

This symbol indicates special instructions for Ex applications.



BATTERY DISPOSAL:

This symbol indicates special information about the disposal of batteries and accumulators.

2. Safety

2.1 Authorized Personnel

All operations described in this document must be carried out by trained, and qualified personnel only. Personal protective equipment must always be worn when working with the sensor.

2.2 Appropriate Use

Note the following:



WARNING: GEMS PRODUCTS MAY ONLY BE USED FOR THE APPLICATIONS DESCRIBED IN THIS DOCUMENT. IF PRODUCTS AND COMPONENTS FROM OTHER MANUFACTURERS ARE USED, THESE MUST BE RECOMMENDED OR APPROVED BY GEMS. PROPER TRANSPORT, STORAGE, INSTALLATION, ASSEMBLY, COMMISSIONING, OPERATION AND MAINTENANCE ARE REQUIRED TO ENSURE THAT THE PRODUCTS OPERATE SAFELY AND WITHOUT ANY PROBLEMS. THE PERMISSIBLE AMBIENT CONDITIONS MUST BE COMPLIED WITH. THE INFORMATION IN THE RELEVANT DOCUMENTATION MUST BE OBSERVED.

2.3 Incorrect Use

Incorrect or inappropriate use of this sensor can increase the likelihood of application hazards not limited to vessel overflow, damage to property, environmental contamination, and damage to the sensor itself.

3. Product Description

The Gems' ULS-100 Universal Level Sensor works with a wide variety of media. It eliminates failure caused by moving parts

and works well in high-viscous, high-pressure, humid, and reflective applications. It does not rely on specific gravity or conductivity. It is simplifying product selection, easing maintenance, and reducing inventory with one common sensor type to replace them all.

- Compact design with less-intrusive flush sensing element
- Accurate and repeatable electronic point level switching
- Durable all 316L stainless steel housing with IP6k9k rating
- Wide media range
- Simplified product selection and reduced inventory using one sensor type to replace many different technology options

Applications

- Construction
- Water & Wastewater
- Emergency Vehicles
- Power Generation
- Renewable Energy
- Buses & Recreational
- HVAC
- Semiconductor
- Agriculture
- Oil & Water TCUs
- Medical & Laboratory
- General Industrial

3.1 Specifications

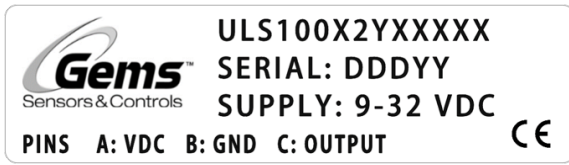
MEDIA		Aqueous, Oil & Hydrocarbon-Based Liquids, Dielectric > 2.2
MOUNTING		1/2"-14 NPT
WETTED MATERIALS	HOUSING	316L Stainless Steel
	O-RING	Buna-N
	PROBE TIP	PBT/PC Blend
OPERATING PRESSURE		Up to 300 PSIG (20.7 bar)
OPERATING TEMPERATURE		-40° F to +185° F (-40° C to +85° C)
SUPPLY VOLTAGE		9-32 VDC
CURRENT CONSUMPTION		6mA Max. (No Load)
OUTPUT		Sinking or Sourcing Output, 9-32 VDC, 300mA Max.
ELECTRICAL TERMINATION		3-pin Deutsch DT04-3P
INGRESS PROTECTION		IPX7 & IP6k9k Per ISO 20653
APPROVALS		CE 2014/30/EU
VIBRATION		IEC 60068-2-6 (FC) (SINUSOIDAL): 20g Peak
		IEC 60068-2-64 (FH) (RANDOM): 0.1G2/Hz (G Squared Per Hertz)
SHOCK		IEC 60068-2-27 (Ea) 50G, 11ms

Reference Operating Conditions: Ambient Temperature: 20°C (68°F) ±5°C; Media Temperature: 20°C (68°F) ±5°C; Process Pressure: 1 Bar (14.5 PSI); Media Type: Water; Humidity: <60% RH Non-condensing

3.2 Part Number Nomenclature

ULS-100 - X - 2 - Y - X - XX - XX						
SERIES	ACTUATION CONDITION	THREAD SIZE	INTEGRAL CONNECTOR	MEDIA BASED SENSING TYPE	TIME DELAY (INCREASING LEVEL)	TIME DELAY (DECREASING LEVEL)
	A - Wet Sink	2 - 1/2-14 NPT	Y - Deutsch DT04-3P	W - Water	00 - Std. 10ms	00 - Std. 10ms
	B - Dry Sink			H - Hydrocarbon	03 - 3 sec.	03 - 3 sec.
	C - Wet Source				05 - 5 sec.	05 - 5 sec.
	D - Dry Source				10 - 10 sec.	10 - 10 sec.

3.3 Sensor Labels



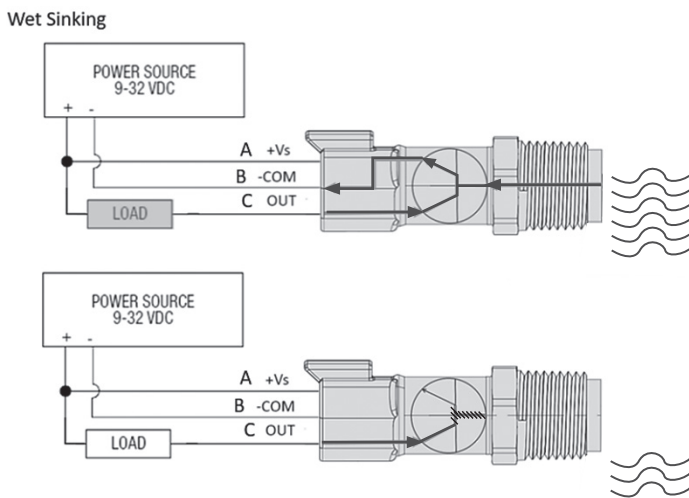
Product Label



Package Label

3.4 Operating Principle

The ULS-100 uses a solid-state switching output. It can be configured from our factory to switch to a positive “true” signal in either wet or dry condition. It can also be configured with a built in delay on rising, falling, or both. The output signal switches state at approximately mid-way up the diameter of the sensor face. Diagram example is shown below (signal “true” when wet).



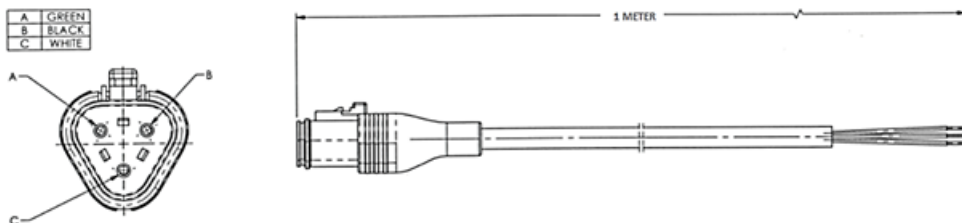
3.5 Sensor Technology

The ULS-100 uses capacitive sensing technology to detect the presence or absence of high (water-based) or low (oil-based) dielectric liquid media.

More on Capacitive sensing can be found here: <https://www.gemssensors.com/resource-center/operating-principles-installation-and-maintenance/level/capacitive-level-switch-operating-principle>

3.6 Accessories

IP67 rated 3 Pin Deutsch Female mating connector GEMS P/N 248404.



4. Installation

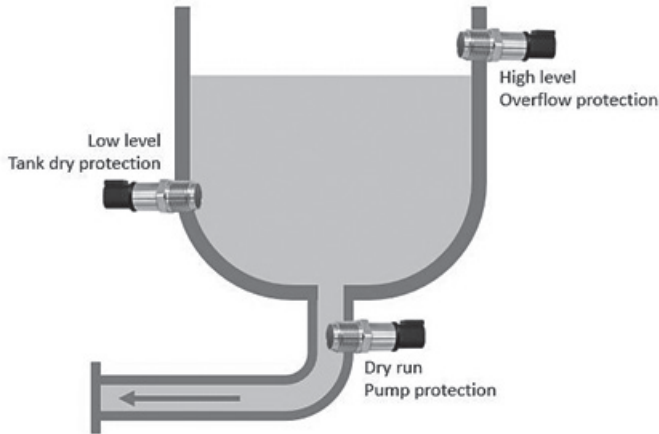
4.1 Mounting

Using thread sealing tape, tighten sensor 2 turns (maximum) past finger tight. Over torque of the sensor can cause permanent damage. If pipe sealant is used, ensure no sealant is accidentally applied to the sensor element gap. Customer must also ensure pressure seal suitability.

4.2 Orientation

Sensor may be mounted in any orientation except vertically in bottom of tank. Customer must review application with special attention to liquid media remaining on flush sensor face when mounted at more severe angles or vertically facing downwards. Optimal performance is with sensor in horizontal position. The sensing element face should be kept at least 0.25" (6.35 mm) away from any surface.


4.3 Installation Examples



5. Electrical Connection


5.1 Safely Connect

All electrical connections should be carried out by qualified personnel.



WARNING: GEMS PRODUCTS MUST BE MAINTAINED AND INSTALLED IN STRICT ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND THE APPLICABLE GEMS PRODUCT DATASHEET THAT COVERS INSTALLATION, OPERATION, AND PROPER MAINTENANCE. FAILURE TO OBSERVE THIS INFORMATION MAY RESULT IN SERIOUS INJURY OR DAMAGES. ELECTRICAL CONNECTIONS SHOULD ONLY BE CARRIED OUT BY TRAINED, AUTHORIZED PERSONNEL. IF OVERVOLTAGE SURGES ARE POSSIBLE, PROPER SURGE PROTECTION SHOULD BE INSTALLED.

5.2 Water Ingress Protection



WARNING: ALTHOUGH THE ULS-100 COMES WITH IP6K9K RATING, THAT DOES NOT INCLUDE THE ELECTRICAL MATING CONNECTION. TO INSURE BETTER PROTECTION FROM MOISTURE INGRESS, PLEASE CONSIDER THE FOLLOWING MEASURES:

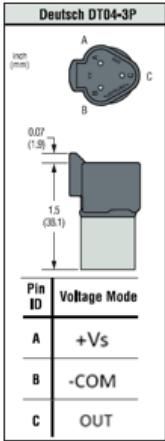
- FIRMLY INSERT THE MATING CABLE UNTIL FULLY SEATED
- PATH THE CONNECTION CABLE OR WIRES DOWNWARDS

5.3 Voltage Supply

SUPPLY VOLTAGE	9-32 VDC
CURRENT CONSUMPTION	6mA Max. (No Load)

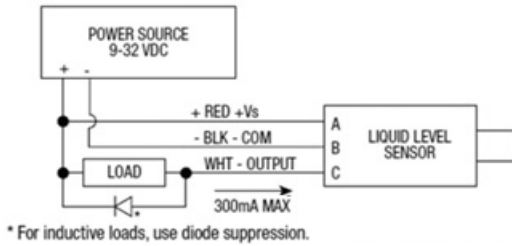
5.4 Wiring

OUTPUT	Sinking or Sourcing Output, 9-32 VDC, 300mA Max.
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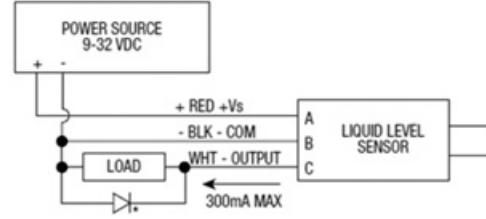


Wiring Diagram

Sinking



Sourcing



More information on sinking vs sourcing found here:

- <https://www.gemssensors.com/blog/blog-details/sinking-or-sourcing-general-overview>
- <https://www.gemssensors.com/blog/blog-details/how-to-choose-between-wet-sink-or-dry-sink>
- <https://www.gemssensors.com/blog/blog-details/how-to-choose-between-wet-source-or-dry-source>

6. Maintenance

6.1 Basic Maintenance

Only use cleaning agents that are compatible with the sensor’s materials. Use proper care when cleaning, and only use methods that do not exceed the housing protection rating.

- Electrical entries and mounting points in an enclosed tank may require liquid/vapor sealing.
- Our sensors must not be field-repaired.
- Physical damage sustained by product may render it unserviceable.

6.2 Basic Troubleshooting

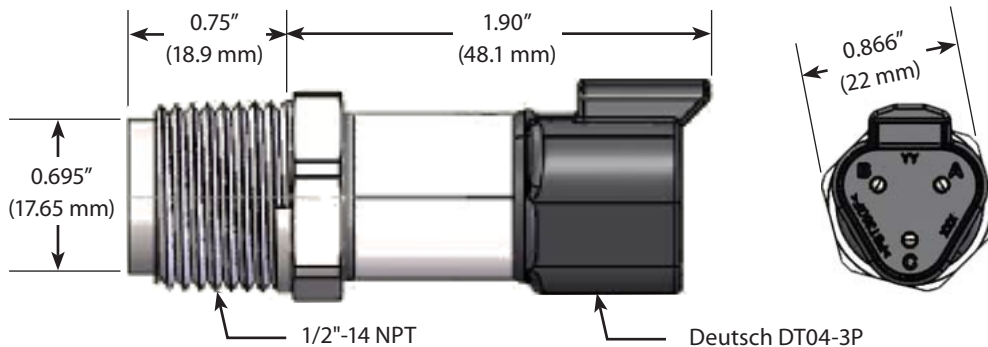
Is the power supply correct?	<ul style="list-style-type: none"> • Standard sensors require a 9 to 32 VDC input. Use a known good power supply as well as a known good voltmeter and see if the sensor responds to media.
Is the wiring correct?	<ul style="list-style-type: none"> • Wiring schematics can be found in the instruction bulletin. • The sensing element face should be kept at least 0.1” (2.5mm) away from any surface.
Did you inspect the sensing element?	<ul style="list-style-type: none"> • Make sure the sensing element is clean without dried-on debris that could cause a false reading, and the face should be kept at least 0.1” (2.5mm) away from any surface.
Are you trying to detect foam or bubbles?	<ul style="list-style-type: none"> • The ULS-100 was designed to ignore these conditions.
Have you tested the sensor?	<ul style="list-style-type: none"> • Remove the sensor completely from your mechanical and electrical system. This will isolate any variable in the circuitry. Test with room temp tap water or engine oil. This way, it is a good known target fluid
Have you reviewed the mounting and switch point location?	<ul style="list-style-type: none"> • The sensor should not be mounted in a port or tube where media can get trapped. It should not be mounted at the top vertically or at a severe angle. Best mounting practice is horizontal direct into tank wall. Liquid level must be at the switch point about half-way up the sensor face.
Is the dielectric constant outside of the sensor’s range?	<ul style="list-style-type: none"> • Please confirm the dielectric constant of the media.

Also see our guide on electrical noise here: <https://www.gemssensors.com/blog/blog-details/electrical-noise-various-causes-and-how-to-avoid-effects>

6.3 Returns

Standard terms & conditions of sale apply. Refer to the document located online at <https://www.gemssensors.com/docs/default-source/resource-files/terms-conditions/gems-customer-terms>. All RA activity must go through the Gems quality services team. To initiate an RA please go to <https://ecatalog.gemssensors.com/support/ra>

7. Mechanical Construction



8. Certificates & Approvals

8.1 Approvals

IPX7 & IP6k9k per ISO 20653

CE 2014/30/EU

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Sensors & Controls

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The Best of What Existing Sensor Types Offer All-in-One Sensor Technology

Universal Level Sensor: Developed For the Most Rugged
Aqueous, Oil, & Hydrocarbon-Based Applications

Trouble-Free Output, No Moving Parts

Solid-State, Sinking or Sourcing,
Wet or Dry Signal

Compact Construction

Fits in Small Spaces, Ideal for
Mobile Applications

Wash-Down & Dust Ingress Protection

IPX7 & IP6K9K Direct-Spray Rating for
Outdoor Use in Harsh Environments



Low-Intrusive Design

Minimal Internal Exposure
to Sensing Element

Great For Outdoor & Harsh Environments

The ULS-100 Universal Level Sensor's sealed construction meets the IP6k9k rating for high-pressure wash-downs. It covers a wide temperature range of -40° F to +185° F (-40° C to +85° C) and a high-pressure range of 300 PSIG (20 bar) to meet the most extreme conditions. Shock and vibration resistance makes the Universal Level Sensor the one choice for mobile applications.

No Moving Parts

The ULS-100 Universal Level Sensor utilizes a solid-state output for point level sensing with high accuracy and repeatability. Without mechanical moving parts, the sensor lasts much longer than common float-type switches which are prone to wear and can fail over time.

Build-Up & Coating-Resistant

The sensing element is made of reinforced a PBT/PC blend, and it features a flush design. This advanced material and unique flush surface construction reduce false signals caused by coating and build-up that often affect other sensor types.

One Sensor, One Solution

The Gems' ULS-100 Universal Level Sensor works with a wide variety of media. It eliminates failure caused by moving parts and works well in high-viscous, high-pressure, humid, and reflective applications. It does not rely on specific gravity or conductivity. It is simplifying product selection and reducing inventory with ONE common sensor type to replace them all.



ULS-100 Universal Level Sensor

One Sensor Fits Many Critical Applications



Construction



Emergency Vehicles



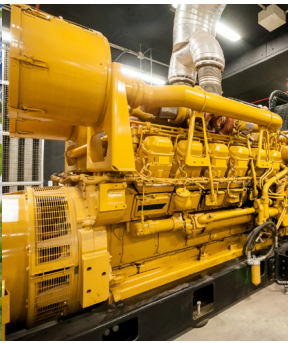
Buses & Recreational



Agriculture



Water & Wastewater



Power Generation



Renewable Energy



HVAC



✓ Brake Fluid



✓ Engine Oil



✓ Radiator Coolant



✓ Washer Fluid



✓ Hydraulic Oil



✓ Transmission Fluid



✓ Tank Level

ULS-100 Specifications

✓ Configuration Options

- Wet or Dry
- Sinking or Sourcing
- Time Delay on Rising or Falling
- High or Low Dielectric

✓ Physical

- 1/2"-14 NPT Mounting
- Less Than 3" Overall Length
- 3 Pin Deutsch Connector
- 316L Stainless Steel Housing
- PBT/PC Blend Sensing Element

✓ Environmental

- Up to 300 PSIG
- -40° F to +185° F (-40° C to +85° C)
- IPX7 & IP6k9k Ingress Protection

✓ Electrical

- 9-32 VDC Supply
- 6 mA Max Current Consumption (No Load)
- Solid-State Output 9-32 VDC, 300 mA Max

ULS-100 Competitive Advantages

✓ **Compact** – The Universal Level Sensor's small footprint and less-intrusive flush sensing element for maximum flexibility

✓ **Reliable** – Accurate and repeatable point-level detection using advanced sensing technology with electronic solid-state switching

✓ **Durable** – Universal Level can withstand harsh conditions and outdoor environments with IP6k9k rating, wide temperature range, and high-pressure capability

✓ **Versatile** – Reduces inventory and simplifies product selection by replacing several different sensor types with the Universal Level Sensor for aqueous, oil, and hydrocarbon based media

✓ **Approvals** – CE

Visit gemssensors.com to View Our Full Range of Products

ULS-100

Universal Level Sensor

Solid-state point level sensor developed for aqueous, oil and hydrocarbon applications.

- Tolerates coating and build-up
- Compact footprint - under 3" total length
- Durable sealed design - IP6k9k
- Longer life expectancy from solid-state technology



SPECIFICATIONS

MEDIA		Aqueous, Oil & Hydrocarbon-Based Liquids
MOUNTINGS		1/2"-14 NPT
WETTED MATERIALS	HOUSING	316L Stainless Steel
	O-RING	Buna
	PROBE TIP	PBT/PC Blend
OPERATING PRESSURE		Up to 300 PSIG
OPERATING TEMPERATURE		-40° F to +185° F (-40° C to +85° C)
SUPPLY VOLTAGE		9-32 VDC
CURRENT CONSUMPTION		6mA Max. (No Load)
OUTPUT		Solid-State, Sinking or Sourcing Output, 9-32 VDC, 300mA Max.
ELECTRICAL TERMINATION		3-pin Deutsch
INGRESS PROTECTION		IPX7 & IP6k9k
APPROVALS		CE

