

# GILL

Sensors & Controls

Introducing our  
Marine Products

GILL

Sensors & Controls

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# Gill Company Overview

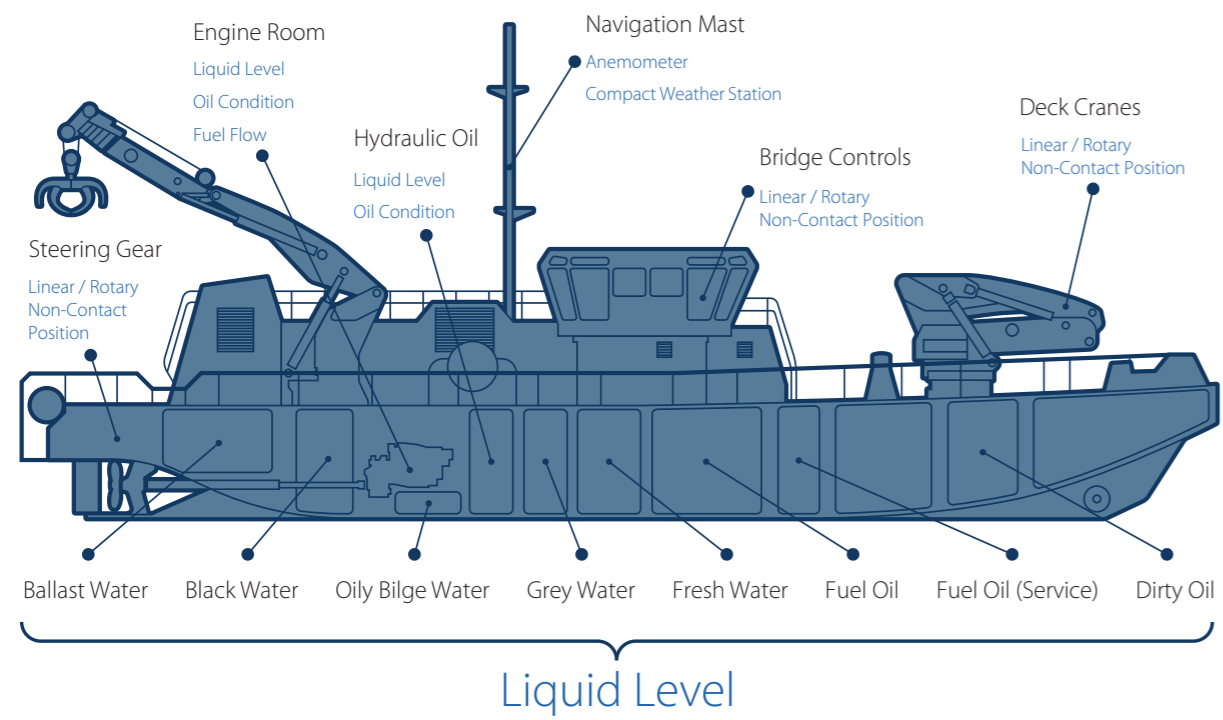
**Gill Sensors & Controls, a constituent of the Gill Group, is a designer and manufacturer of precision sensors.**

Since its creation in 1985, the company has remained a family business, today guided by second generation family members in a professional leadership team. This means that every customer still receives the personal service and attention synonymous with a family business, while retaining the experience and knowledge acquired over time to deliver products that satisfies our customers' needs.

Supported by a team of research scientists and development engineers, we build partnerships with customers using our innate flexibility, responsiveness and close attention to detail, to get products successfully from the design stage, through manufacture and into the marketplace.

Throughout our history we have striven to offer our resources, expertise and technology leadership to be the best at serving the needs of dynamic and demanding industries. The company's mission has been, and continues to be, to achieve this through the pursuit of product excellence and a desire to serve our customers respectfully and professionally.

From this mission, trusting and profitable relationships are born.



Liquid Level  
Sensors in workboats



# Reliable, maintenance-free liquid waste level measurement



## FEATURES

- Suitable for all water-based liquid waste
- Non-stick coating
- Continuous measurement
- Compensates for irregular shaped tanks
- No holes to block
- No moving components

The 7014 Blackwater Liquid Level Sensor has been designed for applications where consistently reliable and maintenance-free measurement of water-based liquid waste is needed.

Having a smooth plastic, non-stick coated probe without any holes or floats, provides accurate liquid level measurements even with suspended particulate matter in the fluid.

This design also means the sensor will not become clogged or jammed by the accumulation of solids, eliminating the need for regular cleaning to maintain a reliable output. The engineering of the probe element means it is rigid enough to tolerate any loads that are caused by the flow of liquid waste without any additional mechanical support.

Tank profiling software supplied with the sensor provides compensation when it is used in irregular tank shapes to provide a true volumetric output and allows for adjustment to any required measurement range.

With a choice of three analogue outputs - Current, Voltage and Resistive - the Blackwater Level Sensor also has a second output consisting of a zero-volt switch which can be set as either a maximum or minimum fluid level warning switch.

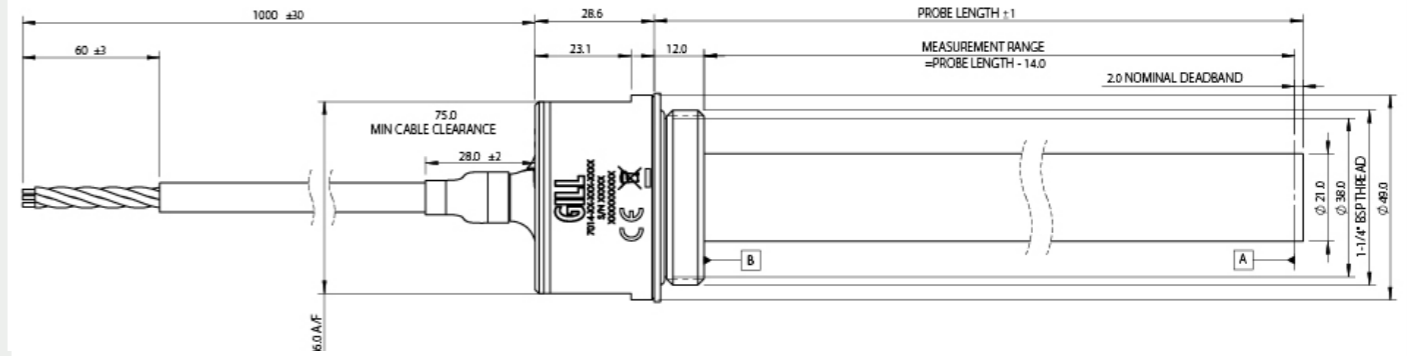


# Reliable, maintenance-free waste liquid level measurement

- Suitable for all water-based liquid waste
- Non-stick coating
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## DIMENSIONS



### SPECIFICATION

<b>Primary Output Accuracy</b>	+/-10% FSD @ 20°C
<b>Thermal Drift</b>	<10% FSD over full temperature range

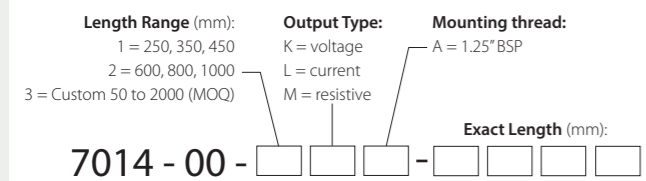
### ELECTRICAL

<b>Supply voltage</b>	+6 to +32V DC
<b>Over Voltage Protection</b>	50V DC
<b>Supply Current</b>	<40mA
<b>Reverse Polarity Protection</b>	-32V DC
<b>Resolution</b>	12 bit (4096 points over measurement range)
<b>Output Update Rate</b>	100Hz (Resistive) 10Hz (0-10V & 4-20mA)
<b>Configuration Interface</b>	Accessible via local micro USB port
<b>Primary (Volumetric) Output</b>	Configurable through user software using tank profiling or file upload
<b>Secondary (Switch) Output</b>	Open collector output 50V / 0.5A max switch to ground (V-)
<b>Secondary Output Hysteresis</b>	Configurable through user software

### RESISTIVE OUTPUT

<b>Primary Outputs</b>	10-180Ω or 240-33Ω selectable through user software
<b>Standard Range</b>	Datum A to Datum B (see Dimensions)
<b>Primary Output Maximum Range</b>	10-1000Ω or 1000-10Ω Configurable through user software

### ORDERING



### ENVIRONMENTAL

<b>Ingress Protection</b>	IP66 / IP68 / IP69k to EN60529
<b>Operating Temperature</b>	-40°C to +85°C (without cable)
<b>Humidity</b>	93% RH at 40°C EN60945
<b>EMC</b>	EN60945 (Marine) EN61000-6-3 (Light Industrial) EN61000-6-2 (Heavy Industrial) EN61326-2-1 (Measurement Control)
<b>Corrosion Resistance</b>	Marine grade stainless steel 316 construction
<b>Differential Pressure</b>	10 Bar
<b>Absolute Pressure</b>	5 Bar
<b>Compatible Media</b>	All conductive liquids
<b>Venting</b>	Use in vented tanks only

### MECHANICAL

<b>Wetted Materials</b>	Stainless steel 316, FEP, EPDM
<b>Probe Length</b>	Range 1: 250, 350 or 450 mm Range 2: 600, 800 or 1000 mm Range 3: Custom 50 to 2000mm (MOQ applies)
<b>Tank Seal Options</b>	EPDM O-ring or Klingersil panel gasket
<b>Cable</b>	Marine standard screened cable (temperature rating -40°C to +75°C)
<b>Cable Pull</b>	3 axis, 50N

### VOLTAGE OUTPUT

<b>Primary Output Standard Range</b>	0.25 - 4.75V DC*
<b>Primary Output Maximum Range</b>	0.25 - 10V DC* Configurable through user software

\* Supply voltage to be at least 0.5 V greater than the required output voltage

### CURRENT OUTPUT

<b>Primary Output Standard Range</b>	4-20mA Range is Datum A to Datum B (see Dimensions)
<b>Primary Output Maximum Range</b>	4-20mA Configurable through user software

### WIRING DESIGNATION

<b>Black</b>	-V (Ground)
<b>Red</b>	+V
<b>Blue</b>	Switch Output
<b>Silver</b>	Bare drain wire
<b>White</b>	Output

# Versatile, robust liquid level measurement



## FEATURES

- Compatible with water, saline, fuels, oils & chemicals
- Stainless Steel construction
- No moving parts for high reliability
- Bolt or thread mounting
- Accuracy +/-2% FSD
- Factory calibrated

The 7010 Liquid Level Sensor is available up to 2 metres long and is designed for applications where measuring a variety of fuels, oils, chemicals, saline and water is required.

Using solid-state capacitive technology to sense the liquid level delivers a sensor with no moving parts, floats or other mechanical linkages providing excellent long term reliability. It features two output options, analogue voltage or current to suit a variety of applications.

Engineered from 316 stainless steel provides corrosion resistance in severe conditions. The sensor has SAE 5-Bolt mounting with either a 1.125" UNF or 1.25" BSP thread. A flange gasket and O-ring seal are supplied with each unit.

Gill Sensors & Controls ensures that every sensor is factory calibrated with temperature compensation to provide reliable market leading accuracy of liquid level measurement.



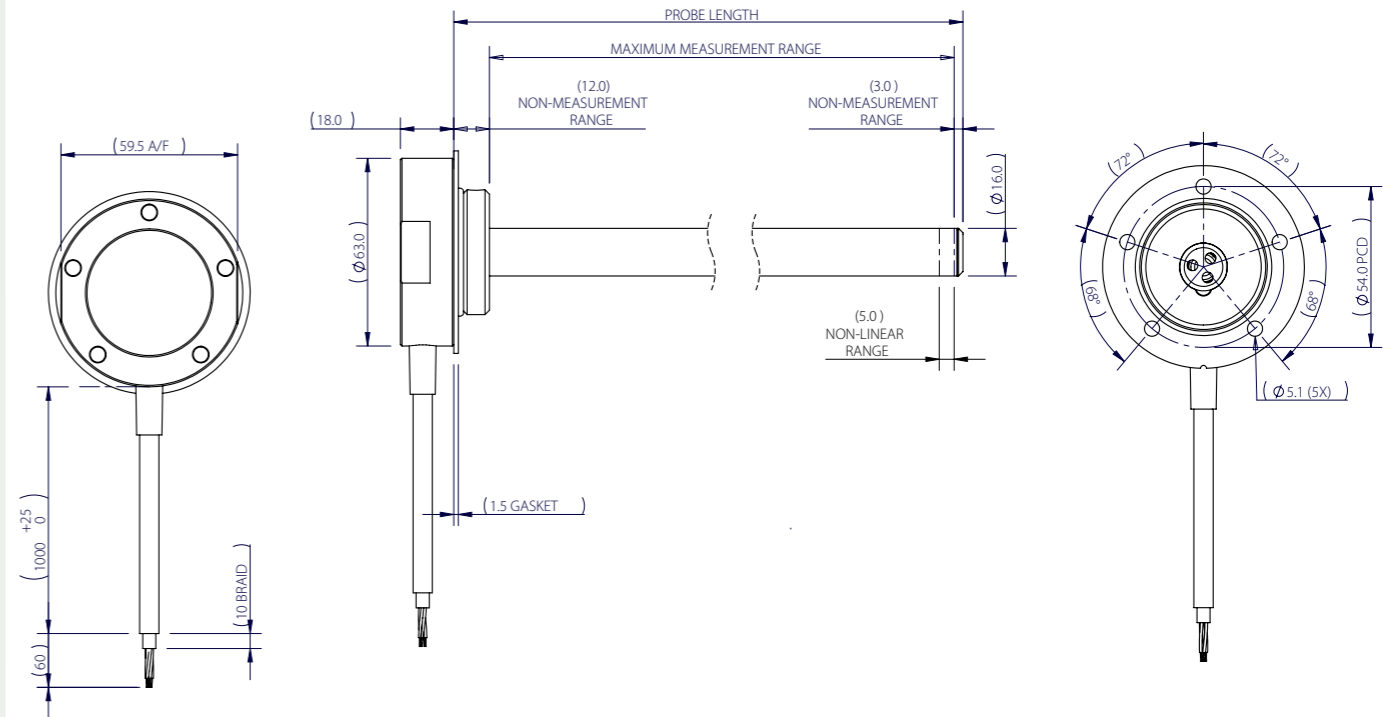


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## DIMENSIONS



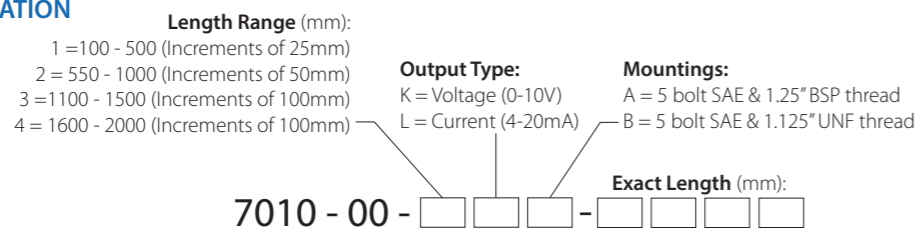
### GENERAL SPECIFICATION

Accuracy	±2% FSD @ 20°C
Linearity	±2% FSD @ 20°C
Operating Temperature	-40°C to +125°C
Humidity	93% RH @ 40°C
Pressure	10 Bar (Differential and Absolute)
Compatible Media	Fresh water, Saltwater, Ethylene Glycol, Gasoline, Unleaded, LRP, Diesel Please consult Gill for other liquids.
Seal Materials	Fluorosilicone O-rings Klingersil gasket
Ingress Protection	IP66, IP68
EMC	EN 610000, EN 61326, EN 60945

### OUTPUTS

Voltage (factory setting)	0.25V - 4.75V
Maximum Voltage Range	0.25V - 10.0V
Current	4-20mA
Switch	Open collector output 50V / 1A max Switch to ground

### ORDERING INFORMATION



### ELECTRICAL

	<b>Voltage</b>	<b>4-20mA</b>
Supply Voltage	+5 to +32VDC	+9 to +32 VDC
Over Voltage Protection	>32 VDC	>32 VDC
Supply Current @ 12 VDC	<15mA	<15mA
Reverse Polarity Protection	to -32 VDC	to -32 VDC
Resolution	10 Bit	10 Bit
Report Rate	10 Hz	10 Hz
Sensor Configuration	Accessible via USB	Accessible via USB

### MECHANICAL

Construction Materials	Stainless Steel 316, FEP, PEI
Probe Length	100mm to 2000mm (in standard increments)
Mounting Options	SAE 5-bolt, 1.125" UNF or 1.25" BSP threaded
Weight	From 300g (dependant on length)
Cable	20 AWG Type 44, DR25
Cable Tail Length	1000mm

### WIRING DESIGNATION

Red	+V
Black	-V (Ground)
Orange	Primary Output
Yellow	Secondary Output
Green	Rx
White	Tx
Silver	Drain wire

### USB - RS232 ADAPTOR (Part number 1484-00-086)

USB - RS232 Adaptor		Sensor	
Red		Red	
Black		Black	
Yellow		White	
Orange		Green	

# Continuous, multi-function oil condition sensing



## FEATURES

- 4 oil condition measurement parameters
- 4-20mA, 0-10v & CAN outputs
- Captures and retains ferrous debris
- Continuous real-time monitoring
- Easy installation
- Low cost of ownership

The 4212 Oil Condition Sensor has been developed to enable the marine engineer to improve the reliability of their equipment. Continuously monitoring the common causes of oil lubrication and hydraulic failure, the sensor provides early indications of a potential problem allowing for planned investigation and remedial action to be implemented before catastrophic failure occurs.

The 4212 Oil Condition Sensor offers four oil condition measurement parameters and without the need for specialised knowledge to analyse the outputs, offers a low cost of ownership. By allowing investigation and repair before an unplanned breakdown, the oil condition sensor gives a quick return-on-investment.

Powerful magnets attract and retain ferrous particles in the oil. This allows Identification of either fine wear particles signalling fluid cleanliness or increased wear rates, or coarse failure pieces giving early indication of potential component failure.

Additionally, the sensor will provide an alarm condition of water contamination in oil, which can lead to subsequent equipment failure, and an oil presence alarm, signalling either low oil levels or leakage.

Available with either 0-10V, 4-20mA or CAN outputs, along with a local visual alarm option, the sensors are designed to suit most data collection devices such as data loggers, PLC's and glass bridge displays. The sensor features an option of simple threads with an O-ring seal for direct fitting into a transmission housing or oil line.





# Continuous, multi-function oil condition sensing

- 4 oil condition measurement parameters
- 4-20mA, 0-10V & CAN outputs
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### ANALOGUE OUTPUT

	Voltage	4-20mA
Channel 1 (fine)	0 – 10V DC (configurable)	1mA - 20mA (configurable)
Channel 2 (coarse)	0 – 10V DC (configurable)	1mA - 20mA (configurable)
Channel 3 (oil/temp)	0 – 10V DC (configurable)	1mA - 20mA (configurable)
Error indication	0 – 10V DC (configurable)	1mA - 20mA (configurable)
Optional output inhibit (during zero/span)	0 – 10V DC (configurable)	1mA - 20mA (configurable)

### ELECTRICAL

	Voltage	4-20mA	CAN
Supply voltage	6 - 32V DC	9 - 32V DC	5 - 32V DC
Over voltage protection		>32V DC	
Power consumption	<0.7W	<2.6W	<0.7W
Reverse polarity protection		to -32V DC	
Analogue resolution		10 bit	
Report rate	10Hz	10Hz	1Hz
Sensor configuration		Accessible via USB	

### MECHANICAL

Sensor size	57 x ø24.5mm
Enclosure	55 x 30 x 12mm
Enclosure mounting	2 off M4 socket cap screws (not supplied)
Materials (sensor)	Aluminium alloy, FEP, PEI
Materials (enclosure)	Aluminium alloy, st/steel, polyester

### LIQUIDS

Fuels	Diesel, gasoline
Oils	Hydraulic, gear, mineral, vegetable, synthetic ester, semi-synthetic, polyalphaolefin, polyalkyleneglycol
Coolants	Ethylene glycol, Water
Other	Salt water

### ENVIRONMENTAL

Sensor protection	IP66 / IP68 / IP69K
Enclosure protection	IP66 / IP68 / IP69K
Differential pressure	10 Bar
Sensor operating temperature	-40° to +150°C
Enclosure operating temperature	-40° to +125°C
Humidity	95% RH @ +55°C

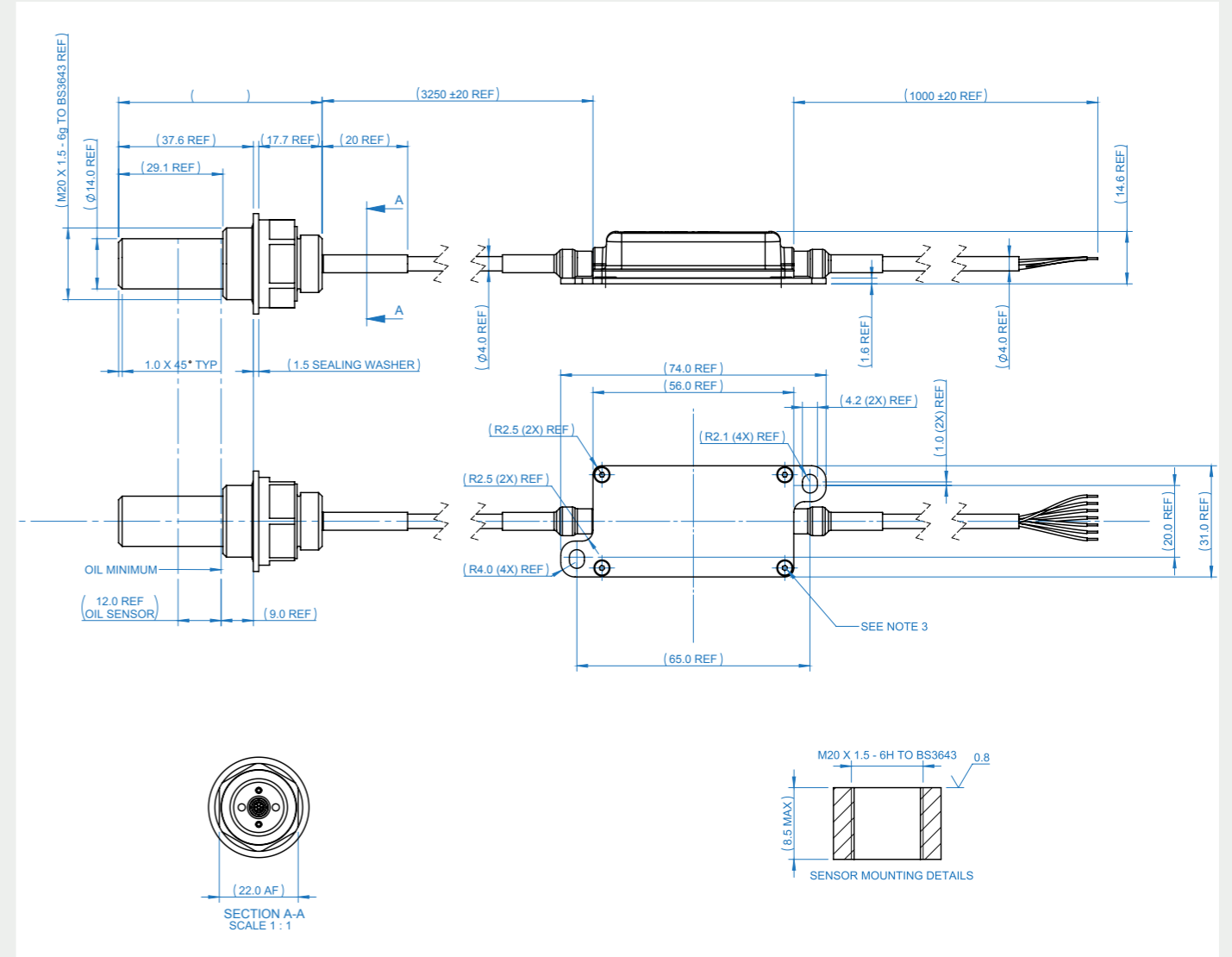
### DIGITAL OUTPUT

J1939 data length	8 bytes
PGN	130816
Byte 0	Coarse measurement percentage, no scaling Value 255 – optional output inhibited during calibration
Byte 1	Fine measurement percentage, no scaling Value 255 – optional output inhibited during calibration
Byte 2	8 Status bits Bit 0 - High/low temperature exceeded Bit 1 - Oil upper threshold exceeded Bit 2 - Oil lower threshold exceeded Bit 3 - Fine measurement error Bit 4 - Coarse measurement error Bit 5 - Oil measurement error Bit 6 - Internal temperature sensor error Bit 7 - External temperature sensor error
Byte 3-7	Manufacturer use

### ORDERING

4212 - PK - [ ] [ ] [ ] — Output:  
 048 = 4-20mA  
 049 = 0-10V  
 050 = CAN

USB cable = 1000-CO-116  
 USB software = 1000-SW-001



### WIRING DESIGNATION

#### 4-20mA & 0-10V

White	Fine
Red	Power
Black	Power ground
Orange	Oil / temperature
Blue	(Not connected)
Green	Coarse
Spare (clear)	Screen

### WIRING DESIGNATION

#### CAN

White	CAN H
Red	Power
Black	Ground
Orange	(Not connected)
Blue	CAN L
Green	(Not connected)
Spare (clear)	Screen

# Gill Sensors improve in-service reliability on fleet of hovercraft.



Gill Sensors have developed high- quality capacitive liquid level sensor for leading international hovercraft manufacturer – Griffon Hoverwork.

With hovercraft propellers and turbulent sea conditions generating high vibrations and unsteady conditions, the accumulation of reliable fuel level data is difficult to achieve. This was the problem faced by Griffon Hoverwork, who required a sensor that could be installed inside the hovercraft fuel tank which would provide continuous and accurate data, whilst remaining fully-functional within severe operational conditions.

Using the existing technology from the standard level sensor range, Gill produced a high-temperature capacitive level sensor with an electronics operating temperature range of - 40°C to +125°C, to meet the high temperatures experienced under the hovercraft skirt.

The sensor is constructed from marine grade 316 stainless steel, is solid-state and has no moving parts to provide long-term durability. In order to ensure that the sensor design and construction would continue to remain seaworthy against the harsh environment requirements, a rigorous testing programme was undertaken, proving environmental aspects such as thermal, humidity, vibration, ingress protection, corrosion resistance and EMC against tough EN60945 standards .

The sensor has also been designed and manufactured with an NMEA 2000 compatible CANBUS output allowing Griffon to connect the sensor with other devices as part of an integrated networking system. Offering both SAE 5-bolt and 1.25" thread mounting for easy installation, the marine sensor provides Griffon with an extremely durable sensing solution suited to the demanding application.

Using in-house design and manufacturing facilities, Gill has been able to deliver Griffon with critical monitoring of fuel levels with confidence that the accuracy and reliability is maintained during hovercraft operation.

The sensors have been deployed as a standard fit into the new fleet of hovercraft to ensure ultimate in-service reliability throughout the expected life of the craft.

# Where do World Champions go for their level sensors?



Travelling at 200mph without leaving the ground would be, most people would agree, an exciting prospect.

Smooth tarmac in a high performance car would be thrilling enough for most, but for that extra frisson of excitement, some take to the water in Class 1 Offshore Powerboats.

To achieve 200mph on the water takes a lot more effort than propelling a car along tarmac. Two 9 litre, turbocharged V-8 engines producing around 1350 HP each, with a fuel consumption of around 170 US gallons per hour per engine is required to propel a 47 foot catamaran at these speeds.

Apart from the extra power required for high speed on water, is that water has the annoying characteristic of not being smooth. So to achieve these speeds the boats are designed to 'plane' on the tops of the wave with only the propellers constantly submerged in the water.

There are a number of ways that the boat is designed to help achieve this objective of keeping the hull stable and skimming across the surface of the water, one of which is ballast tanks.

These tanks are moulded into the boats structure and filled with seawater using a mechanical pick-up mechanism and emptied using an electric dump pump. The tanks are monitored and trimmed when, for example, the boat is to change direction or the wind direction changes, altering the wind loading on the hull.

To allow the Throttleman to optimise the use of the ballast tanks, they need to know the level of water in each tank. Despite the best efforts of the vessel to keep smooth and steady as it crosses the water, it is seldom a smooth journey – in fact, it is a punishing environment with repeated extreme vertical shock loads, plus the corrosive environment of salt water.

World-renowned racer and eight times World Champion Steve Curtis, MBE found that the typical sensors supplied with the tanks lasted between 1-2 races before the physical environment lead to their failure.

So Steve sourced stainless steel capacitive level sensors from Gill Sensors & Controls, a company with a reputation for providing sensors that endure in the most severe environments. With a solid state, integrated electronics design with no moving parts, the sensors had more chance of surviving for more than a single race.

And they did. The sensors lasted for eight years without a single failure and provided a level of accuracy and reliability that enabled Steve and his teams to continue to perform at the highest level. So whilst you may not want to travel at 200mph in a powerboat, if you want a sensor that is proven to last in the toughest conditions, visit [gillsc.com/level](http://gillsc.com/level).

Steve is currently throttleman with the Miss Geico Racing team, which can be seen in full flight in the image above. We are grateful to Steve for his help with this story and wish him and the team good luck in future competitions.



# If it's a liquid, Gill can measure it.



## **Industry: Noun. 'Economic activity concerned with the processing of raw materials and manufacture of goods in factories'. (Oxford Dictionaries)**

A brief definition representing such a broad range of industries it is very difficult to grasp the full range of activities that it covers. Plus from all of those activities come an even larger number of processes required to produce those goods and raw materials.

So if a company wishes to develop a range of liquid level sensors that will measure virtually all the types of liquids to be encountered in industry that is going to need a lot of sensors.

Well, not necessarily.

Because if you break it down a little, there are broadly two types of liquid – water based and non-water based.

Water based includes anything with water content sufficient to make the liquid conductive. That can be fresh water all the way through to liquid waste products which can contain solids, sludge or paper, for example.

Non-water based covers oils, fuels, chemicals and saline fluids that again can be used in the processes of industry or a by-product from it.

The demands placed on industrial equipment means that sensors designed for those applications will need to be reliable, accurate and consistent without requiring regular maintenance or cleaning.

For sensors to achieve those key attributes they will benefit from the use of high quality materials, have no moving parts and an extended operating temperature range. Sealing to IP68/IP69K is another desirable feature along with resistance to shock and vibration, aided by solid state construction.

Additionally, in the case of the water based sensor, it is worth ensuring that any measuring probe does not have any holes or cavities in it to clog or block. A smooth, non-stick surface enabling reliable operation without regular cleaning maintenance, in even the most contaminated liquids, is another feature to look for. If your process does require regular cleaning or flush through of the manufacturing line a smooth, cavity-free sensor probe will re-assure you that it will not require any additional cleaning.

The other thing to bear in mind is that many tanks and vessels are not always regular shapes, when a half full reading will not mean half the tank volume. Software that allows you to 'map' the shape of the tank and then correlate the output of the sensor to the true volume of the tank eliminates problems arising from misleading readings.

So if you work in industry and have a requirement for liquid level measurement, no matter what type of liquid it is or how difficult and unpleasant it is, you will want to contact Gill Sensors and Controls.

They have two industrial sensors available. The 7010 Industrial Liquid Level sensor is for non-water based fluids, whilst the 7014 Waste Liquid Level Sensor has been designed for all water based liquids, especially high-viscosity, heavily contaminated products that are difficult to measure with conventional sensors.

## **Gill Sensors & Controls Limited**

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