

Model **LLWS** Capacitive Water Level Sensor (For Upper and Lower Limit Detection/Ground Electrode Type)



Model List	Detection Electrode Length		Operation Status
	Lower Limit / GND Electrode	Upper Limit Electrode	
LLWS-205	200 mm	50 mm	Normally open
LLWS-2051			Normally closed
LLWS-305	300 mm	50 mm	Normally open
LLWS-3051			Normally closed
LLWS-3020	300 mm	200 mm	Normally open
LLWS-30201			Normally closed

Application

- Water level control for domestic tap water.
- Water level control for boiling water in water heaters.
- Water level control of pure water, purified water, and distilled water.

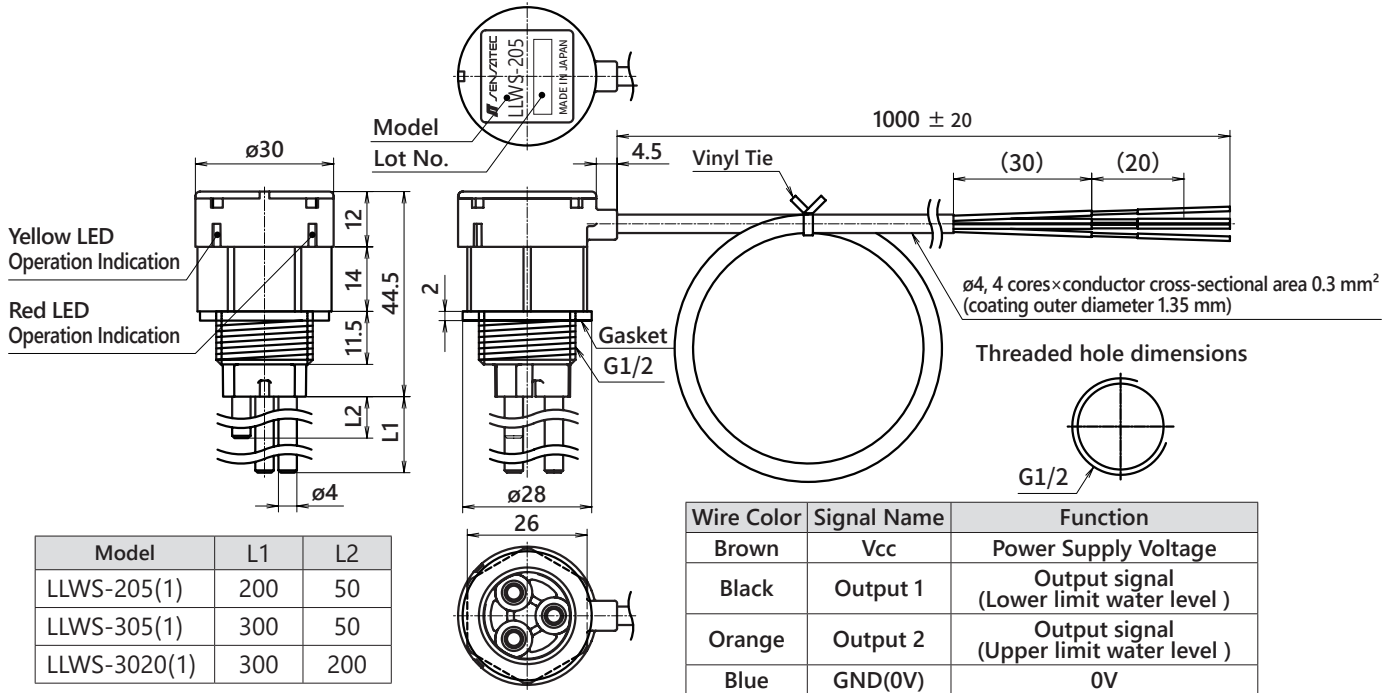
Features

- This sensor can directly detect hot water used in coffee servers and vending machines.
- This sensor can detect two points, the upper limit and the lower limit of the water level, making it ideal for water level control.
- This sensor does not require an external amplifier. Therefore, it is ideal for saving space and reducing the cost of external amplifiers.
- The detection electrode using the anti-polarization capacitor can prevent the electrolytic corrosion of the electrode and realize stable performance for a long period of time.
- The upper and lower water level detection status can be confirmed by LED.
- By using the ground electrode type, water level can be detected even in a small plastic tank.
- It has high operational reliability against water stains and can be used for a long period of time.

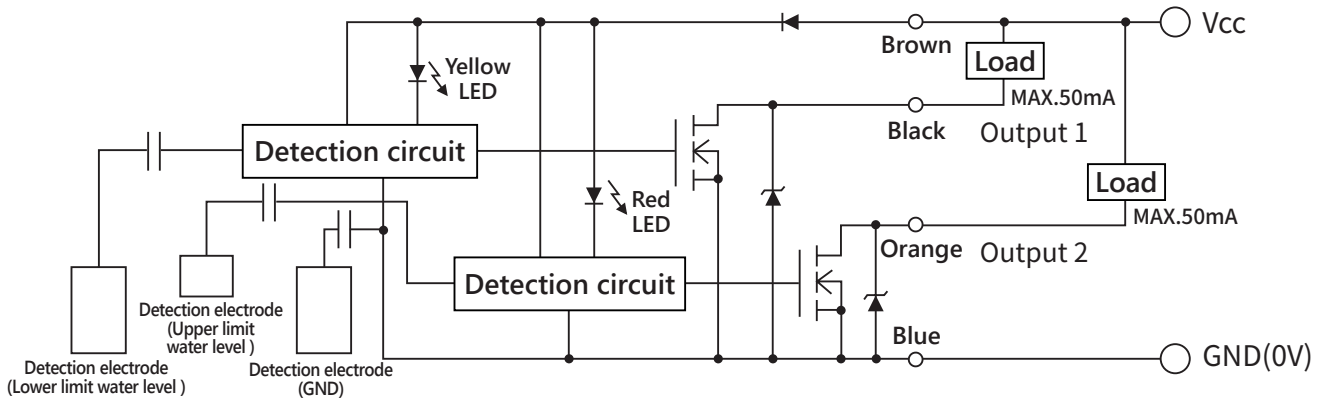
Rating/Performance

Model	LLWS-205	LLWS-2051	LLWS-305	LLWS-3051	LLWS-3020	LLWS-30201
Standard Detection Target	Tap water or boiling water					
Withstand Pressure Resistance	0.3 Mpa (at atmospheric pressure outside tank : 0.1 Mpa)					
Tank Thickness at Sensor Mounting Point	1 to 2.5 mm					
Power Supply Voltage	12 V to 24 V DC (Operating voltage range : 10.8 to 26.4V DC)					
Current Consumption	20 mA DC or less					
Output	Nch MOSFET, Open drain 30V DC 50mA DC or less at each output					
Output Residual Voltage	1 V DC or less (Load current 50 mA DC at cable 1 m)					
Operation Status	Normally open (On output with the water level detected)	Normally closed (Off output with the water level detected)	Normally open (On output with the water level detected)	Normally closed (Off output with the water level detected)	Normally open (On output with the water level detected)	Normally closed (Off output with the water level detected)
Operation Indication	Lower limit water level : yellow LED, Upper limit water level : red LED (Lit when output is ON)					
Response Time	50 ms max					
Temperature Range	-10 to 100 °C (-10 to 65 °C storage temperature range) (Without dew condensation or icing)					
Humidity Range	95 % RH or less (85 % RH or less during storage humidity range) (Without dew condensation)					
Dielectric Strength	500 V AC for 1 minute (Between live parts and the mounting nuts)					
Insulation Resistance	50 MΩ or more, at 500 V DC megger (Between live parts and the mounting nuts)					
Vibration Resistance	10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions for 2 hours each (at power off)					
Shock Resistance	500 m/s ² (Approx. 50 G) in X, Y and Z directions 10 times each (at power off)					
Protection	IP 67					
Material	Case cover : SPS resin with glass Detection electrode : SUS304 Gasket : White EPDM rubber The materials used in parts that come into direct contact with water/moisture conform to "Standards for Food Additives" in Japan, defined under the Japan Food Sanitation Law.					
Cable	ø4, 4-core round cord of 0.3 mm ² and insulation 1.35 mm and 1 m in length (Oil and heat resistant vinyl)					
Options (sold separately)	PMS-NB24H7G12S (Hexagon nut G1/2 SUS304 Thickness : 7 mm)					
Weight	95 g		115 g		129 g	

Dimensions

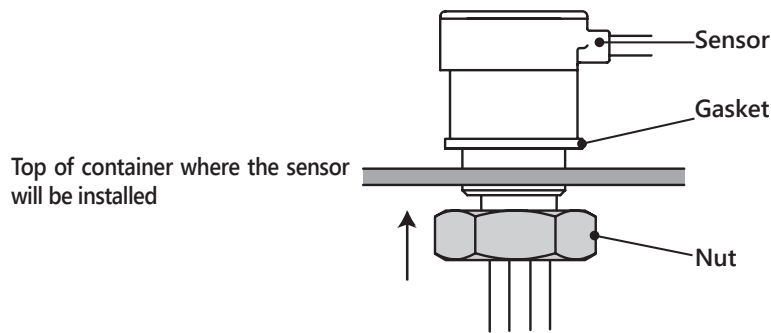


Output Circuit



Precautions During Use

- 1 This sensor is a vertical mounting type. Please use it by inserting the detection electrode vertically downward from the top surface of the tank. Install the sensor body, gasket, top surface of the tank, and nut in this order.



- 2 This sensor can directly detect boiling water in a water heater as well as tap water. It can also detect the level of pure water, purified water, and distilled water. However, the water level detected by the sensor rises about 15 mm above the actual water level.
- 3 Note that this sensor is not designed to detect the levels of liquids with low relative permittivity (ϵ_s), such as ice, alcohol, oil, and others.
- 4 The output of this sensor may not be restored if water contains highly conductive substances such as salts, acids, and alkaline substances, as well as surfactants and adhesive substances. It is the same as the state where the detection electrode and GND are always electrically connected and short-circuited. Please check the usage carefully before use.
- 5 When using the sensor in tap water together with a water heater for extended periods, caustic lime and polluted sludge sediment contained in the water will gradually accumulate. The sensor may not recover if there is a lot of unwanted material between the inner wall of the tank and the detection electrode, or between the GND detection electrode and other detection electrodes via the surface where the case electrode is located. Thus, there is a need to be removed and cleaned regularly.
- 6 Since the three detection electrodes are connected to the circuit section, do not apply a voltage higher than the rated power supply voltage to the electrode section. Make sure that the DC power supply for the sensor has sufficient dielectric strength between water and the commercial power supply before use.
- 7 Be sure to tighten the G1 / 2 nut (sold separately) for mounting with a torque of 1.5 N · m (15.4 kgf · cm) or less.
- 8 Although the detection electrode is fixed, never apply rotational force to it. Also, do not apply stress or bend the electrodes. Do not pull the cable.
- 9 - Multiple sensors cannot be used in the same tank due to mutual interference.
- Multiple sensors cannot be used for the same liquid to be detected due to mutual interference.
- 10 The syndiotactic polystyrene resin with glass used for the LLWS series cases and cover materials has excellent chemical resistance to acids and alkalis. However, glass fiber, which is blended as a reinforcing material for syndiotactic polystyrene resin, has a limit in resistance to strong acids and strong alkaline solutions. Therefore, if the skeletal structure of glass fiber is chemically deteriorated by acid or alkali, it will cause cracks in the case or cover. Solvents of relatively less impact on the product when exposed to high temperatures for long periods of time are aromatic, chlorinated organic, and ketone-based solvents. Be sure to perform the test in the usage environment before using it.
- 11 The length of the detection electrode can be freely cut and adjusted. When changing the length of the detection electrodes, make the lengths of the two longer detection electrodes the same.
- 12 Please contact us if you wish to change the length of the detection electrode or the material of the component.
- 13 When detecting hot water such as boiling water, use a heat insulating material between the sensor case and the tank to suppress the temperature rise of the sensor case. The reliability of the sensor built-in parts is improved, and the failure rate during long-term use can be reduced.
- 14 This sensor detects the capacitance of the detection electrode (upper or lower limit) with reference to the ground electrode. Therefore, stable detection is possible even when the amount of water is small.

Precautions During Use

- 15** This sensor can detect not only general tap water, but also pure water, purified water, distilled water, and boiling water in a water heater.
- 16** When used in a water heater for a long period of time, the lime and sludge contained in the water are gradually concentrated and grow.
If the concentrated impurities accumulate between the inner wall of the tank and the detection electrode, the sensor may not operate normally. Be sure to clean the inside of the tank regularly to remove sediment.
- 17** This sensor cannot detect the level of liquids with a very small relative permittivity such as ice, alcohol and oil, as well as powders and particles other than water. If you want to detect such liquids and powders, please contact us.
- 18** This sensor may not be able to detect liquids that are high in highly conductive substances (salts, acids, alkalis), surfactants and sticky substances.
This liquid causes the detection electrode and the inner wall of the tank to be electrically short-circuited, which interferes with the normal operation of the sensor.
Also, when the liquid is acidic or alkaline, the detection electrode and mounting M10 nut may corrode.
For these reasons, be sure to evaluate the sensor in the actual usage environment before using it.
- 19** Since the detection electrode is electrically connected to the sensor circuit, do not apply a voltage higher than the rated power supply voltage to the electrode.
Also, ensure sufficient insulation resistance and dielectric strength between the liquid to be detected and the power supply at the DC power supply section of the sensor.
- 20** The material of the detection electrode and the G1 / 2 nut (sold separately) is SUS304.
Stainless steel has excellent corrosion resistance due to the formation of an oxide film on the surface, but it is not perfect.
If chloride ions are present in the liquid, the oxide film may be locally destroyed by foreign matter adhering to the electrode surface or the difference in oxygen concentration of water, and erosion may occur very slowly.
To prevent this erosion, there are measures such as avoiding chloride ions and regularly removing the attached foreign matter, but it is difficult to completely prevent corrosion.
Since general tap water is sterilized with chlorine, it contains chloride ions at a concentration of 0.1 ppm to several ppm. However, the detection of this sensor is not affected because the corrosion progresses very slowly at a very low concentration. Corrosion prevention measures can be examined by selecting appropriate detection electrode and M10 nut materials in consideration of usage conditions.
If you are concerned about the progress of corrosion, please consult with us about changing materials.
Also, for liquid detection of chemicals (acids, alkalis, solvents, oils, etc.), the material of the detection electrode and the G1 / 2 nut (sold separately) : SUS304 may not be able to withstand the chemicals.
Please use it after being evaluated under the conditions of use and confirming its safety.
- 21** If any substance other than water (acid, alkali, solvent, oil, etc.) is mixed in the detection liquid, be sure to perform a test considering the durability of the EPDM gasket before use.
- 22** The detection electrode is fixed, but do not apply unnecessary rotational force.
- 23** Do not pull the cable to apply stress.
Do not put a load on the cable at any time (during storage or use).
When installing the sensor, firmly fix the cable near the sensor body.
If the cable continues to be stressed, the cable may come off the sensor body or break inside the cable.
- 24** No measures against sulfurization are taken.
If metal parts such as sensors and detection electrodes are sulfided by sulfur gas generated in hot spring water containing sulfide ions or in an environment where rubber is often used, the sensor may not function.
- 25** As a guide, perform maintenance inspections (daily inspections and regular inspections) once every six months to one year. Depending on the operating conditions such as operating temperature, humidity, and pressure, perform it more frequently and reliably.
In addition, remove the deposits inside the tank and the sensor, and visually check for foreign matter in the tank.
- 26** If the detection liquid contains solid matter, the sensor may be damaged if it repeatedly hits the detection electrode (SUS304) or the case of the sensor due to the flow of the liquid.
To use the sensor for a long period of time, remove solids (precipitates / deposits) regularly, check for contaminants, and use a structure that does not allow solids to hit.
- 27** This sensor is not explosion-proof. Do not install in a dangerous place with flammable or explosive liquids or gases.

Precautions During Use

- 28** The operating principle of this sensor is to detect the capacitance between the detection electrode and the ground. When using a switching regulator power supply or a power supply that generates a large amount of common mode noise, be sure to ground the FG terminal of the product equipped with this sensor to suppress the common mode noise that causes malfunction.
When grounding through the housing of the product body, be sure to join (electrically) the connections between machines so that contact resistance does not occur.
Also, when using a power supply that does not have a built-in FG terminal or common mode noise filter, connect the sensor power supply GND (0 V) directly or via a capacitor of several μF to the ground.
- 29** If the magnet is brought close to the sensor case, the sensor may malfunction or the detection sensitivity may be affected. When a magnetic field is applied to the sensor, make a thorough verification in advance before deciding whether or not to use it.
- 30** This sensor uses a weak high frequency.
When used to detect highly conductive liquids, the detection electrodes are affected by high frequencies from ambient equipment through this liquid.
Check the effects of high frequencies transmitted to the detection electrodes under actual market conditions.
If it is affected by peripheral equipment, etc., connect the GND line (0V) of the sensor directly to the housing of the sensor mounting tank or via a capacitor of about 2,200 PF.
Use a capacitor with a withstand voltage value that has a sufficient margin for the specifications.
- 31** If you want to change the shape or material of the detection electrode, design a new one, or separate it, consider using our touch sensor (model: HTS-30Z) for the sensor part.
- 32** Before using the sensor, be sure to check the actual operation under actual usage conditions (for example the installation method of the sensor or your product, installation location, and surrounding environment).
Only use after sufficient pre-evaluation, assessment of operation, performance, or reliability in a state representative of use in your product.
Be sure to perform pre-evaluation for the items in advance that are not listed in the specifications.
- 33** Be sure to contact us first if the product is being considered for use in an application which requires extremely high reliability, where its breakage, malfunction, or operation can be reasonably expected to be, directly or indirectly, a significant threat to human life, or can cause injury, or damage to property, including, but not limited to medical equipment, automobiles, aerospace vehicle instruments, nuclear power control equipment or other equipment or instruments. In normal use, be sure to provide safety measures to avoid secondary disasters to ensure the safe operation of the entire system.
- 34** Avoid use and/or storage of the product in a place where it can be exposed to the following; water, oil, chemical solutions, dust, and corrosive gas; abrupt temperature changes; direct sunlight; vibration or shock. Dew condensation or freezing may affect the product performance.

*For other detailed specifications, refer to the specification sheet of the corresponding model.