Level meter type, model selection guide

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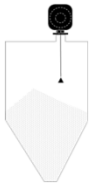
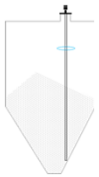
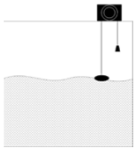
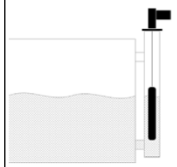
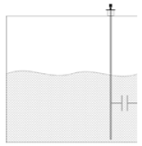
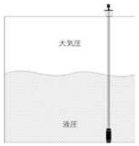
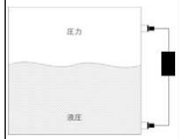
Type of Level Meter

Level meter is a sensor for monitoring storage level of raw materials and products stored in tanks and silos.
Raw materials and products have various states such as mass, particles, powders, liquids, slurries, and submerged deposits, and there are several measurement methods in consideration of physical characteristics and environmental factors.
In addition, level meters are roughly divided into two methods: method of measuring empty scale distance from the tank ceiling to object to be measured, and method of directly measuring storage level of object to be measured.
Level meters that measure aerial distances are sounding, ultrasonic, microwave, laser range finders, guide rope type, liquid level gauges, and displacers.
Capacitance, pressure, and differential pressure gauges directly measure storage level.

	Weight (Sounding) Level meter	Ultrasonic Level meter	Electric wave Level meter [Pulse radar type]	Electric wave Level meter [FMCW type]	Guide rope type Level meter	Laser type Level meter [TOF type]	Laser type Level meter [Phase difference detecting type]	Float type Level meter	Displayser	Capacitance type Level meter	Pressure type Level meter	Differential pressure Level meter
Level meter												
Principles	Measures by electrically winding down a weight hung on the wire rope until it lands on object to be measured. The time from start of measurement to landing of the weight is measured and converted to empty scale distance. (Distance = Speed x Time)	Non-contact level meter. Time of ultrasonic pulse transmitted from sensor, reflected from object to be measured, and returned to the sensor is measured and converted to empty scale distance.	Non-contact level meter. Time of Microwave pulse transmitted from sensor, reflected from object to be measured, and returned to the sensor is measured and converted to empty scale distance.	Non-contact level meter. Time of ultrasonic pulse transmitted from sensor, reflected from object to be measured, and returned to the sensor is measured and converted to empty scale distance.	Microwave pulse is transmitted along rope hanging from tank ceiling into tank, and the time until the microwave reflected from object to be measured returns to the sensor is measured and converted to empty scale distance.	Non-contact level meter. Time of lazar pulse transmitted from sensor, reflected from object to be measured, and returned to the sensor is measured and converted to empty scale distance.	Non-contact level meter. Sensor emits an amplitude-modulated laser. Phase difference from object to be measured reflects to sensor is converted to empty scale distance.	A float hung on stainless steel tape is floated on the liquid surface to follow fluctuations in the liquid level. The empty scale distance is measured by constantly measuring the length of the tape. There are float spring balance type, seal pipe type, and counterweight	Displacer is a float that is made heavier than specific gravity of object to be measured (liquid) and designed to sink into it. The buoyancy of the displacer suspended in the liquid changes in proportion to the change in the liquid level. The change is mechanically captured and converted into a level.	Capacitor is formed by probe electrode hanging from tank ceiling into tank and tank wall. When object to be measured enters between electrodes, the capacitance changes in proportion to the amount. It is measured and converted to storage level.	Diaphragm captures change in hydraulic pressure due to liquid level and converts it to the storage level. However, it will be used under condition that pressure inside the tank is atmospheric pressure.	It consists of two diaphragms that measures hydraulic pressure, other measure internal pressure of tank. Storage level is calculated by subtracting tank internal pressure from hydraulic pressure.
Features	Easy to understand because it is physically measured. Even if a large amount of dust or steam is generated, it does not affect the measurement. Used also to detect submerged sediments.	Non-contact level measurement is possible at a relatively low cost.	Not affected by temperature or gas because it uses radio waves. Not easily affected by dust and steam since it is permeable.	Not affected by temperature or gas because it uses radio waves. Not easily affected by dust and steam since it is permeable.	Suitable for installation in narrow places with no radiation angle like ultrasonic wave and non-contact microwave.	Directional and can be used for non-contact measurement in narrow spaces. Some can measure hundreds of meters. Relatively safe laser (class 1) is used. Fast responsiveness.	Highly directional and suitable for non-contact level measurement in narrow places. Some have Max measurement distance 100m. High accuracy and high resolution.	Simple structure and widely used for detecting liquid level in large and small tanks due to its accuracy and durability.	Effective for measuring liquid level in low specific gravity and high pressure environment.	Suitable for measurement in narrow places.	Easy to install even in places where installation space is small.	Measurable without being affected by pressure changes in tank.
Weak points	Consumables such as wire ropes are needed and maintenance is inferior. Needs to be careful when use in area where foreign matter is prohibited because it contacts with object to be measured.	There is limit to measurement in environment where dust and steam are generated. If temperature gap or gas is generated in measurement area, speed of sound will change and error will occur.	Measured object with low delectric constant may not be able to measure because reflected wave is weak and transmitted. Ex: silica	Measured object with low delectric constant may not be able to measure because reflected wave is weak and transmitted. Ex: silica	There is a possibility of erroneous measurement if adhesion to probe part is severe. When wire kink, wire breakage, adhesion occurs, noise is reflected and erroneous measurement is likely to occur.	In environment where dust or steam is generated, laser diffuses and measurement is not possible. Due to directivity, if object to be measured is flat like a mirror surface and has repose angle, the reflected wave becomes weak and it tends to be impossible to measure.	In environment where dust or steam is generated, laser diffuses and measurement is not possible. Due to directivity, if object to be measured is flat like a mirror surface and has repose angle, the reflected wave becomes weak and it tends to be impossible to measure. Laser classes tend to be high and safety management is required.	Affected by adhesion. Many consumables are needed and lacks maintainability. There is error due to deposition of solids on float. When used inside wave breaker, float may not move smoothly due to effect of adhesion and may malfunction.	Measurement range is short as 300 mm, 3000 mm. Gets caught due to sticking or dust and malfunctions. Spring is consumables. Recalibration is required in environment where liquid density of measured object changes.	There is possibility of contamination as it is contact type. Necessary to empty tank and adjust to zero. Error occurs in measured object whose relative permittivity changes.	Accuracy becomes bad If there are many foam in liquid because pressure is uneven. Accuracy becomes bad If there is a lot of adhesion or sedimentation of solid matter. If many foam are generated, hydraulic pressure will be sparse and measured value will be incorrect. Since liquid pressure changes depending on specific gravity of the liquid, it is necessary to adjust it. Empty the tank for maintenance.	Accuracy becomes bad If there are many foam in liquid because pressure is uneven. Accuracy becomes bad If there is a lot of adhesion or sedimentation of solid matter. If many foam are generated, hydraulic pressure will be sparse and measured value will be incorrect. Since liquid pressure changes depending on specific gravity of the liquid, it is necessary to adjust it. Empty the tank for maintenance.

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Level Meter Model selection guide

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Introduction There is no perfect level meter that can measure anything.
It is necessary to consider main conditions such as physical characteristics, measurement environment, installation conditions, and disturbances when making a selection from multiple level meters.
However, if these conditions are further subdivided, they will cover more than a dozen items, and combination will be astronomical numbers.

How to use Therefore, in this guide, we tried to narrow down the main factors to select the model.
First, select one of the objects to be measured: bulk, particle, powder, liquid, slurry, and deposit in liquid.
Then, select required number of physical characteristics and environmental factors from the remaining selection items.
Judgment of ○ △ × is shown between the selected condition and each level meter.
The strictest judgment among them is the total judgment of the level meter.
Please select the best level meter from the total judgment.
If multiple candidates appear, we propose to select them in consideration of installation conditions, price, maintainability, etc.

<Judgment>
○ : applicable
△ : With any special specifications or option only, may be applicable
× : not applicable

Material Phisycal property Application / Type / Definition		Weight (Sounding) Level meter	Ultrasonic Level meter	Microwave Level meter [Pulse radar type]	Microwave Level meter [FMCW type]	Guide rope type Level meter	Laser type Level meter [TOF type]	Laser type Level meter [Phase difference detecting type]	Float type Level meter [Mechanical winding type]	Displaser type Level meter	Capacitance type Level meter	Pressure type Level meter	Differential pressure Level meter
Bulk	dia.10mm - 50mm	○	○	○	○	○	○	○	×	×	○	×	×
Particle	less than dia. 10mm	○	○	○	○	○	○	○	×	×	○	×	×
Powder	less than dia. 1mm	○	○	○	○	○	○	○	×	×	○	×	×
Liquid	Water, Chemical solution etc.	×	○	○	○	○	○	○	○	○	○	○	○
Slurry	Viscous material	×	○	○	○	○	○	○	×	×	○	×	×
Deposit in liquid	Deposit material in liquid	△	×	×	×	×	×	×	×	×	△	×	×
Low density	Less than 0.5	△	○	○	○	○	○	○	×	×	○	×	×
Low dielectric constant	Less than 2.0	○	○	△	△	△	○	○	×	×	×	×	×
High conductivity	Conduct electricity	○	○	○	○	○	○	○	×	×	○	×	×
Electrical properties change	Dielectric constant and conductivity change	○	○	△	△	△	○	○	×	×	△	×	×
Dust	Dust blocks view	○	△	○	△	○	×	×	×	×	△	×	×
Steam	Steam obstructs view	○	△	○	△	○	×	×	×	×	△	×	×
Dust & Steam	Dust and steam generated at the same time	△	×	△	×	△	×	×	×	×	△	×	×
Adhesion	Can be wiped off with waste cloth	△	△	△	△	×	×	×	×	×	△	×	×
Foam	Unmeasurable due to foam	×	△	△	△	△	×	×	○	○	△	△	△
Corrosion	Corossive material	△	△	△	△	△	△	△	△	△	△	△	△
High temperature	80 deg.C or higher	△	×	△	△	△	△	△	×	×	△	△	△
High pressure	Higher than atmosphic pressure	△	×	△	△	△	△	△	×	×	△	×	○
Negative pressure	lower than atmosphic pressure	△	×	△	△	△	△	△	×	×	△	×	○
Narrow place	Width Φ1m at measurement distance 10m	△	△	△	○	○	○	○	△	△	○	○	○
Waveguide measurement		×	×	○	○	×	○	○	○	○	○	○	○

* In case of judgment △, judgment will change depending on conditions, so please contact us whether it is applicalbe.

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