

MFS-606S

Liquid Level Sensor

User Manual



1.Product Introduction

The MFS-606S Cuttable Oil Level Sensor utilizes advanced RF capacitive detection circuitry. Through precise temperature compensation and linear correction by an internal processor, it can simultaneously output both analog and digital liquid level signals. The sensor is free of any elastic or moving parts, making it impact-resistant and easy to install. It is suitable for accurate measurement of non-conductive media such as gasoline, diesel, and hydraulic oil in various applications.

Product Features: The sensor features an on-site calibration mechanism. With a single sensor, users can perform liquid level calibration via a calibration wire, regardless of changes in the measured medium or if the medium height cannot reach the sensor's full scale. This allows the sensor to adapt to the current measurement medium and range, providing accurate liquid level signals.

Considering the complex requirements of on-site environments and the varying shapes and sizes of oil tanks, this product has been developed to be highly adaptable. During use, the sensor can be cut within a specified length range (up to 50% of its original length) based on the actual installation environment. After adjusting the sensor's zero and full points, it can function properly at the new length.

2.Performance Specifications

Code	Items	Details	Note
1	Operating Voltage	5V~24V	Permissible Range: 4.5V~36V
2	Operating Current	5mA~10mA	
3	Pressure Rating	-0.1MPa~0.4MPa	
4	Length Range	200mm~1400mm	Refer to the Cuttable Product Ordering Form
5	Lead Length	1000mm	Length can be customized as required
6	Probe Diameter	Φ16mm	
7	Operating Temperature	-35℃~75℃	
8	Storage Temperature	-40℃~85℃	
9	Probe Temperature Resistance	-50℃~150℃	
10	Installation Method	Thread / Flange Installation	M20*1.5, Flange-drill Φ45mm
11	Explosion-proof Rating	Explosion-proof Exd II CT5	

12	Accuracy Grade	$\pm 2.5\%$	Applicable: MFS-606S
13	Digital Output	RS485	The product only supports one type of signal as output.
14	Analog Output	Voltage: 0~3.3V、 0~5V	Max. 0~10 V

Cutable Product Order Form

Model	Maximum Cutable Length	Maximum External Height of the Fuel Tank	Minimum External Height of the Fuel Tank
MFS-606S750C	375	750	458
MFS-606S400C	200	400	200

**Attention:**

The accuracy grade measurements are based on laboratory static test results. Actual accuracy may vary depending on the real installation environment.

3. Lead Definition

Color	Introduction	Note
Red	Power Positive	
Black	Power Negative	
Yellow	RS485	RXD Receiving End
Green	RS485	TXD Transmitting End
Brown	Voltage Output	0-10V Adjustable
White	Liquid Level Calibration	Zero Setting, Fully Tuned

**Attention:**

The sensor supports voltage signals and digital simultaneous output. The analog output defaults to 0-5V but can be customized based on customer requirements. Proper insulation must be applied when the device is not connected.

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The calibration wire is only intended for use after the sensor has been cut and during debugging. After debugging, proper insulation must be applied. It is prohibited to come into contact with the positive or negative terminals of the power supply during use.

4.Sensor Calibration

The product is calibrated at the factory. If on-site adjustments are necessary, follow these steps: The white wire is the calibration wire, the red wire is the positive power supply, and the black wire is the negative power supply.

Full Tuned on-site: Place the sensor into the measuring medium (if it is already installed and difficult to remove, you can raise the liquid level by adding fuel). When the liquid level reaches the position of the vent hole on the top of the sensor (if the sensor is installed or the liquid level cannot reach the highest position of the sensor, use the full container or the actual highest measurement as a reference), short-circuit the white wire and the red wire for more than 10 seconds with the sensor powered on.

Zero-Setting on-site: Remove the sensor from the measuring medium (if it is already installed and difficult to remove, you can lower the liquid level by removing fuel). When the liquid level is below the bottom position of the sensor (if it is installed and cannot be viewed or removed easily, the container needs to be emptied), short-circuit the white wire and the red wire for more than 10 seconds with the sensor powered on.

After calibration, observe if the output value is close to the actual value. Note that the analog and digital filter values may have a certain delay after the liquid level changes due to filtering effects. It is recommended to wait for about 3 minutes after the liquid level stabilizes for testing, or power off the sensor for 5 seconds and then power it on again for comparison testing. If the error is too large, recalibration is required.

After calibration, be sure to insulate the calibration wire (white wire) to avoid contact with any metal or wire

5.Sensor Installation

① Select a well-ventilated location for installation. Prior to installation, ensure that fire extinguishing equipment is placed in a convenient location for easy access. Check that all accessories and tools are complete and appropriate. Open the fuel tank cap to ensure proper ventilation inside the tank.

Installation Tools				Sensor Accessories	
Name	Specification	Name	Specification	Name	Quantity
Adjustable Varying-speed Electric Drill		Screwdriver	Slotted , Cross	Sensor	1 Unit
Tape	3M	Allen Key	3mm	Flange	1 Set

Steel Saw, Cutter		Oil-resistant Sealant		Rubber Pad	1 Piece
Drill	45 mm	Water-Proof		O-ring	1 Unit
Marker pen		Wire Stripper		Plug	1 Unit
File		Binding Tape	5mm	Manual	1 Unit
Nose Pliers		Fire-fighting Equipment		Certification	1 Unit

② Position Selection: Choose a suitable central position on the fuel tank for installing the oil level sensor (avoiding weld seams, internal partitions, pipelines, or obstacles such as sensors). First, clean the surface of the fuel tank of any oil residue. Use a hole puncher to create a circular hole at the center position above the fuel tank. When drilling through, slightly tilt the electric drill, and after piercing through one side, remove the debris using needle-nose pliers to avoid metal pieces and debris from falling into the interior of the fuel tank.

③ After retracting the three fixing pins, insert the sealing gasket into the sealing position (a small amount of sealant can be applied to both sides of the gasket; ensure even application to prevent overflow). Place the flange clamp into the hole prepared in the fuel tank. After retracting the fixing pins, use an Allen wrench to alternately tighten the bolts on the flange (rotate each bolt 2-3 turns before moving to the next bolt; pay attention to whether the fixing pins retract and affect the tightening of the clamp; adjust as necessary during the tightening process).

④ Sensor Length Confirmation: Use a tape measure to measure the distance from the hole in the fuel tank (before installing the flange) to the bottom of the tank (the sensor height should not exceed the maximum external height of the tank). This measurement represents the sensor height (the remaining length of the sensor after cutting should not be less than half of the original length).

Use a manual saw, knife, or cutting machine (no gas cutting allowed) to cut the sensor to the desired length based on the actual height of the fuel tank. Remove any burrs and debris, and ensure that the cutting surface is as flat as possible. Use a file to remove burrs from the outer and inner surfaces of the sensor, keeping the surfaces smooth and clean. Also, clean any metal shavings remaining between the inner and outer tubes.



⑤ Installation of Seal and Lower Plug: Begin by installing the rubber seal at the end of the inner core. Then, insert the lower plug into the aluminum tube at the cut end of the sensor, fitting it over the inner core. This will secure and fasten the lower plug in place.

⑥ Sensor Calibration (Adjusting Full Scale and Zero Point): Submerge the sensor into the measured liquid until it reaches the position of the top vent hole. With the sensor powered on, short-circuit the calibration wire (white wire) and the power supply (red wire) for more than 10 seconds to adjust to full scale. Remove the sensor once the measured medium has been completely discharged. After all liquid has drained out of the sensor, with the sensor still powered on, short-circuit the calibration wire (white wire) and the negative pole (black wire) for more than 10 seconds to adjust to zero.

⑦ Sensor Fixation: Insert the sensor into the flange after fitting it with an O-ring. Rotate clockwise to secure the sensor.

⑧ Connect Communication Cable: Connect the communication cable according to the wiring definition or corresponding connector.

⑨ Check Liquid Level: Once the wiring is confirmed to be normal, power up the sensor and check if it is functioning properly. If any anomalies occur, troubleshoot according to common fault diagnosis methods.

⑩ Close the fuel tank cap and restore the fuel tank to its initial state.

Attention: To ensure the accuracy of sensor usage, the installation position (front, rear, left, and right) should be as close to the center of the fuel tank (or container) as possible. This minimizes the impact of tilting and fluctuation of the fuel surface caused by vehicle movement, especially when going uphill or downhill. As shown in the diagram below, when the fuel surface tilts, the fuel level at the edges of the tank will be higher or lower depending on the direction of the tilt. Placing the sensor at the edge of the tank may result in an overestimation or underestimation of the measured value.

6.Note for Use

1. Multiple sensors can be connected simultaneously on an RS485 bus, but each sensor must have a unique communication address to prevent bus lock-up. The RS485 bus uses a half-duplex chip, so when reading data, the module should be given response time. The time interval between two consecutive commands should not be less than 200ms.

2. Installation environment: Given the complexity of the installation environment, it is recommended to use an isolated power supply for power supply. The communication lines should not be too long, and it is advised to use shielded cables.

3. Power Supply Voltage: The power supply voltage for the sensor must not exceed its normal operating voltage. The power consumption of the power supply should not be less than the power consumption of the sensor during normal operation.

4. Operating Environment: The actual environment should meet the basic parameters of the sensor and not exceed the normal range; otherwise, it may cause sensor damage or other accidents.

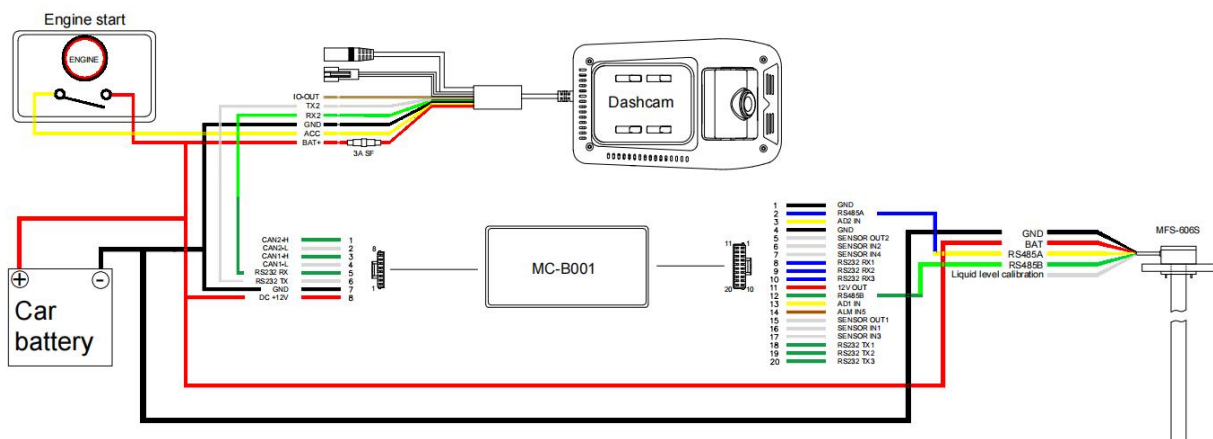
5. Sensor Output: The sensor outputs the position height signal of the measured medium. Without filtering, the output values form a curve that reflects the actual changes in the oil level, which fluctuates with the rise and fall of the oil level. When filtering is applied, the curve becomes smoother. The greater the filtering value, the smoother the curve, but the oil quantity value will lag behind the actual changes in the oil quantity. Therefore, the smoothness of the curve is directly proportional to the lag time (response time) of the oil quantity value. The factory-set filtering value is determined based on customer feedback and field conditions, which is considered suitable.

6. Sensor Calibration: Due to differences in the medium between the factory settings and the actual medium used in the field, users should perform sensor calibration before use.

7. Wiring

The host's TX2 connects to the MC-B001's RS232 TX. The host's RX2 connects to the MC-B001's RS232 RX. The host's GND connects to the MC-B001's GND.

Connect the RS485A port of the MFS-606S to the RS485A port of the MC-B001. Connect the RS485B port of the MFS-606S to the RS485B port of the MC-B001.



8.Dashcam & MDVR Host Configuration

After completing the wiring, power on the main unit and accessories, connect your mobile phone to the main unit's Wi-Fi, and use the configuration app (MCTool) to configure the parameters. The specific configuration is as follows:

- ① MCTool > Setting > Peripheral > COM1
- Function selected as ExternBox
Type selection is 232
Baud rate selected as 115200
Others remain as default values.

<

COM1

peripheral

Function	ExternBox	>
Type	232	>
Baud Rate	115200	>
Data Bit	8	>
Stop Bit	1	>
Parity	None	>

Save

Extern

- CO1 > Extern > Peripheral > COM4-485
- Function selected as Oil-CR
Baud rate selected as 9600
Others remain as default values.

 **COM4-485**

peripheral

Function	Oil-CR	>
Baud Rate	9600	>
Data Bit	8	>
Stop Bit	1	>
Parity	None	>

Save

② MCTool > Setting > Serial Information

Check whether the status of COM1 and COM5 is normal.

 **Serial Information**

Name	COM1
Function	ExternBox
Status	normal
Remarks	

Name(Extern Serial)	COM5
Function	Oil-CR
Status	normal
Remarks	Type 2:0,0,0,0,0

9. MettaXIOT Platform configuration

1) Monitor

Please first ensure that the device has been deployed on the MettaXIOT platform and has valid location information.

2) Devices > IMEI > Search > Edit

Locate the device requiring configuration within the platform and proceed to edit it.

MettaX IoT

DashboardCustomersUsersDevicesMonitorVideoReports

17:00:49(UTC+08:00)

liaower

Devices

IMEI5679

ModelSelect

Device NameEnter device name

LabelSelect

Activation Time

Start dateEnd date

Device statusSelect

PhonePlease enter your phone num

☐ Include sub-customer data

Search

Reset

Sell Devices

Export

Batch Commands

Batch Update

Add

Add Devices in Bulk

License Binding

Tag Management

No.	Device Name	IMEI	Model	Activation Time	Expiration Time	ICCID	Assigned customer	Operation
1	MC202-75679	940077775679	MC202	2024-11-26 19:35:08	2035-01-25	-	DevTest	Edit command

3) Sensor Configuration > Add Sensors
Add a new Sensor

MC403-74715(353079374715) ×

Basic Information

Calculation Rules

Sensor Configuration

License

Data

Daylight Saving Time

IO

Add

No.	Sensor No.	Sensor Name	Sensor Type	Sensor Model	Operation
-----	------------	-------------	-------------	--------------	-----------

Sensor Type: Select Fuel Level
Sensor Model: Select MFS-606S-RS485
Sensor Name: Enter as needed

Others remain as default values.

Sensor Configuration

Get Sensor Value

* Sensor Type

Fuel Level

* Sensor Model

MFS-606S-RS485

Basic Information

Sensor No.

* Sensor Name

606S

Sensor Information

The system provides a default display name for each field, which you can modify according to your preference.

Item Name

Fuel Tank Level (mm)

* Alias Name

Fuel Tank Level (mm)

Item Name

Fuel Quantity(l)

* Alias Name

Fuel Quantity(l)

Save

Fuel level height data acquisition

Get Sensor Value

Fuel Tank Level: Actual fuel level data read after refueling

Sensor Configuration

Get Sensor Value

* Sensor Type

Fuel Level

* Sensor Model

MFS-606S-RS232

Basic Information

Sensor No.

* Sensor Name

606S

Sensor Information

The system provides a default display name for each field, which you can modify according to your preference.

Item Name

Fuel Tank Level (mm)

* Alias Name

Fuel Tank Level (mm)

Item Name

Fuel Quantity(L)

* Alias Name

Fuel Quantity(L)

Save

Sensor Configuration

Close

Get Sensor Value

* Sensor Type

Fuel Level

* Sensor Model

MFS-606S-RS232

Basic Information

Sensor No.

* Sensor Name

606S

Sensor Information

The system provides a default display name for each field, which you can modify according to your preference.

Item Name

Fuel Tank Level (mm)

* Alias Name

Fuel Tank Level (mm)

Item Name

* Alias Name

606S

MFS-606S-RS232

Fuel Tank Level (...)

507

2/3

18:22

Fuel Quantity(L)

0

2/3

18:22

Save

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Calibration (It is recommended to refuel at least 5 times. The more refueling cycles performed, the more accurate the detection. The smaller the volume per refueling cycle, the more precise the detection.)

Fuel Tank Level (mm) : Actual liquid level height read after refueling

Fuel Quantity (L) : Enter the actual amount of fuel added.

Sensor Configuration

Get Sensor Value

Calibration Rules

Set up the relationship between tank level and remaining fuel. At least one calibration point is required.

No. 1 - Calibration Rules

* Fuel Tank Level (mm)

0

* Fuel Quantity(L)

0

No. 2 - Calibration Rules

* Fuel Tank Level (mm)

30

* Fuel Quantity(L)

5

No. 3 - Calibration Rules

* Fuel Tank Level (mm)

60

* Fuel Quantity(L)

10

Save

13 / 14

Sensor Configuration

Get Sensor Value

No. 3 - Calibration Rules

* Fuel Tank Level (mm)

60

* Fuel Quantity(L)

10

No. 4 - Calibration Rules

* Fuel Tank Level (mm)

90

* Fuel Quantity(L)

15

No. 5 - Calibration Rules

* Fuel Tank Level (mm)

120

* Fuel Quantity(L)

20

No. 6 - Calibration Rules

* Fuel Tank Level (mm)

150

* Fuel Quantity(L)

25

Save