

GAUGING & SYSTEMS

DDA DIGITAL MAGNETOSTRICTIVE PROBE

AT A GLANCE

APPLICATIONS

The DDA Magnetostrictive probe offers both a precise and cost effective method for product measurement in various storage vessels up to 25 ft (7.6M) high. The DDA probe is most suitable for applications involving clean and finished products such as jet fuel, propane and diesel at refineries, tank farms, gas storage facilities and terminals.

The DDA probe provides highly accurate continuous readings of:

- **Level**
- **Product interface (i.e. BSW)**
- **Multi-spot temperature**

COMMUNICATIONS

Outputs from the probe are communicated via a 4-wire multi-drop power and data bus (EIA-485), eliminating the requirement for individual cable runs from each tank. All versions are intrinsically safe, when connected to approved safety barriers, for installation in hazardous areas.

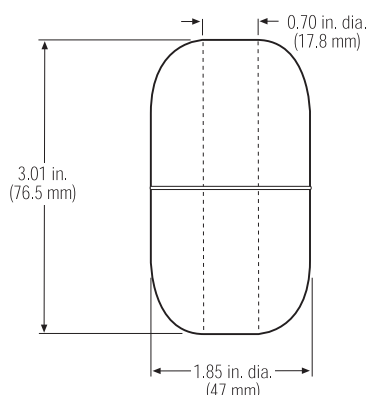
MATERIAL CONSTRUCTION

Using resilient lightweight materials, all wetted parts are constructed from of stainless steel as standard. The electronics housing is manufactured from a chemical resistant epoxy painted aluminium enclosure. The MSP probe is available with special material options such as Hastelloy, Monel and Teflon for aggressive products and extreme tank environments.

FLOATS

Illustrated below is the standard float used with the DDA probe. A wide selection of other floats are available for such considerations as:

- **Material of construction**
- **Corrosion resistance**
- **Measuring interface level**
- **Density of product or interface liquid**



INSTALLATION

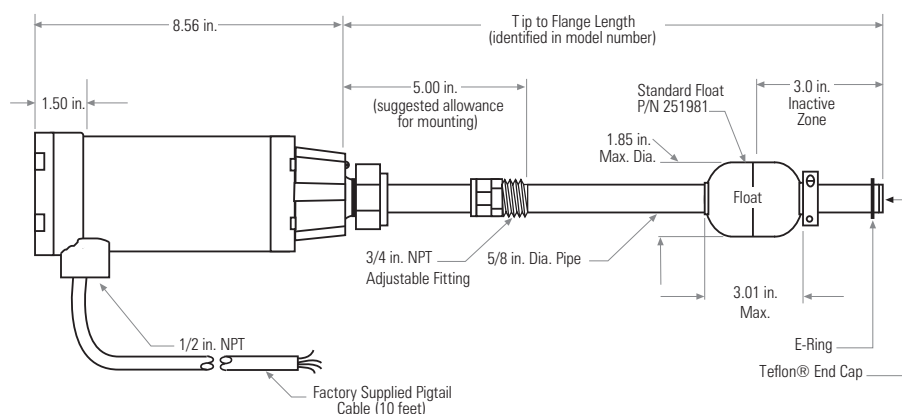
The DDA probe can be easily mounted through a top opening in a tank by means of a flange or plug. As standard the probe is supplied complete with 3/4" NPT compression fitting.

MAINTENANCE

The DDA probe utilises non-contacting magnetostrictive technology with the only moving parts being the float. This simple design ensures that any scheduled maintenance will be minimised.

- **3 MEASUREMENTS IN 1 PROBE – LEVEL, TEMPERATURE AND BSW**
Measures all the necessary parameters for advanced inventory management
- **HIGH ACCURACY**
Provides improved inventory management with an accuracy that exceeds American Petroleum Institute (API) accuracy recommendations
- **PROBE SUITABLE FOR TANKS UP TO 25 FT (7.6M) HIGH**
Suitable for small/horizontal vessel applications
- **DIGITAL EIA-485 (DDA PROTOCOL) COMMUNICATION SUPPORTS UP TO 20 PROBES ON A SINGLE BUS**
Provides reduced installation & wiring costs





PRODUCT ORDER CODES

D8 & D9, RIGID MAGNETOSTRICTIVE PROBES

CODE A	DEVICE TYPE				
8	Intrinsically safe (-30 to 160°F, -34 to 71°C)				
9	Intrinsically safe (-30 to 300°F, -34 to 149°C)				
CODE B	UNITS OF MEASUREMENT				
1	Inches				
2	Millimeters				
CODE C	GAUGE LENGTH				
XXXX	Length equals vessel height plus 5 inches (127 mm) for mounting purposes Standard Range: 24.0 to 300.0 in. (610 to 7620 mm), encode as 0240 to 3000 (0610 to 7620)				
Standard lengths:					
Length	Code	Length	Code	Length	Code
24 in. = 0240	610 mm = 0610	168 in. = 1680	4267 mm = 4267		
36 in. = 0360	914 mm = 0914	180 in. = 1800	4572 mm = 4572		
48 in. = 0480	1219 mm = 1219	192 in. = 1920	4877 mm = 4877		
60 in. = 0600	1524 mm = 1524	204 in. = 2040	5182 mm = 5182		
72 in. = 0720	1829 mm = 1829	216 in. = 2160	5486 mm = 5486		
84 in. = 0840	2134 mm = 2134	228 in. = 2280	5791 mm = 5791		
96 in. = 0960	2438 mm = 2438	240 in. = 2400	6096 mm = 6096		
108 in. = 1080	2743 mm = 2743	252 in. = 2520	6401 mm = 6401		
120 in. = 1200	3048 mm = 3048	264 in. = 2640	6706 mm = 6706		
132 in. = 1320	3353 mm = 3353	276 in. = 2760	7010 mm = 7010		
144 in. = 1440	3658 mm = 3658	288 in. = 2880	7315 mm = 7315		
156 in. = 1560	3962 mm = 3962	300 in. = 3000	7620 mm = 7620		
NOTE: Tank gauges not ordered in the above standard lengths will be treated as custom orders and subject to additional cost and lead time.					
CODE D	NUMBER OF RTD'S				
0	No temperature output				
1	1 RTD (located at 8 in. [203 mm] from tip of gauge)				
5	5 RTDs (equal spacing with temperature averaging)				
CODE E	MOUNTING				
6	3/4 in. NPT Adjustable Fitting				
CODE F	ROD MATERIAL				
2	316L Stainless Steel				
4	Teflon (15 PSI [0.103 Mpa], -30 to 100 °F [-34 to 38 °C])				
NOTE: Contact Whessoe Varec for availability of other materials.					

D **A B C D E F**

When ordering or requesting a quotation from Whessoe Varec, choose options from suffixes to complete the order code. Please refer to separate data sheet for specific, non-standard float options.

LEVEL OUTPUT

Measured Variables:

Product level and interface level

Level Range:

2 to 25 ft. (610 mm to 7.6 m)

Level Accuracy:

0.025% of F.S. or 0.03 in. 90.794 mm)

Level Hysteresis:

0.001% of F.S. or 0.005 in. (0.127 mm)

Level Repeatability:

0.001% of F.S. or 0.001 in. (0.025 mm)

Level Resolution:

Up to ± 0.001 in. (0.025 mm)

TEMPERATURE OUTPUT

Measured Variable:

Averaging and multipoint temperature (up to 5 RTDs).

Temperature Range:

D8: -30 to 160°F (-34 to 71°C)

D9: -30 to 300°F (-34 to 149°C)

Temperature Accuracy:

± 0.5°F (± 0.28°C)

Temperature Resolution:

Up to ± 0.02°F (± 0.01°C)

ELECTRONICS

Input Voltage Range:

24 to 26 Vdc at safety barrier input

Reverse Polarity Protection:

Internal series diodes

Safety Approval:

FMRC and CSA intrinsic safety approval for Class I, II, III, Division 1, Groups C, D, E, F, G hazardous areas

CALIBRATION

Zero Adjust Range:

Software selectable along entire active gauge length.
No field adjust required

ENVIRONMENTAL

Enclosure:

O-ring sealed for outdoor use (NEMA 4)

Humidity:

0 to 100% R.H.

Operating Temperature:

Electronics: -40 to 149°F (-40 to 65°C)

D8: -30 to 160°F (-34 to 71°C),

D9: -30 to 300°F (-34 to 149°C)

<0.001% per °C (0.0005% per °F)

Vessel Pressure:

1.896 MPa maximum (275 PSIG)

Materials

Wetted: Standard - 316L stainless steel,
Optional - Hastelloy, Teflon, Monel

Non-wetted: Epoxy painted aluminium

FIELD INSTALLATION

Length :

2 to 25 ft. (610 mm to 7.6 m) excluding housing

Electronics housing:

3.75 in. (95.3 mm) diameter x 8.6 in. (218.4 mm) long

Tank Mounting:

3/4 in. NPT adjustable fitting

2 1/2 in. (63.5 mm) sanitary fitting available as option

Wiring:

4 wire connections of shielded cable to factory provided pigtail cable (10 ft.) through 1/2 in. NPT conduit opening

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WHESSOE VAREC

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The company reserves the right to change the specification or design without prior notice.
The Magnetostrictive Probe is manufactured by MTS Systems Corporation.
Visit Whessoe Varec's internet site at <http://www.whessoevarec.com>

Rev. Mag-005-3-99

GAUGING & SYSTEMS

LDF DIGITAL MAGNETOSTRICTIVE PROBE

AT A GLANCE

APPLICATIONS

The LDF Magnetostrictive probe provides precise level measurement for large storage tanks up to 60ft (18M) high. The probe's flexible one piece construction ensures that installation on a tank is time efficient and often eliminates the need to empty the tank. The LDF probe is most suitable for applications involving clean and finished products such as jet fuel, propane and diesel at refineries, tank farms, gas storage facilities and terminals.

The LDF probe provides highly accurate continuous readings of:

- **Level**
- **Product interface (i.e BSW)**
- **Multi-spot temperature**

COMMUNICATIONS

Outputs from the probe are communicated via a 4-wire multi-drop power and data bus (EIA-485), eliminating the requirement for individual cable runs from each tank. All versions are intrinsically safe, when connected to approved safety barriers, for installation in hazardous areas.

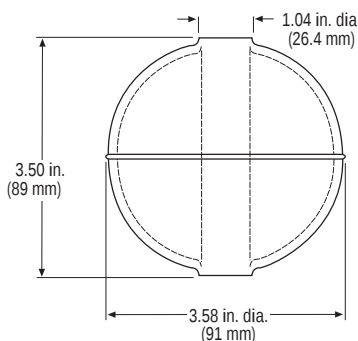
MATERIAL CONSTRUCTION

Using resilient lightweight materials, all wetted parts are constructed from of stainless steel as standard. The electronics housing is manufactured from a chemical resistant epoxy painted aluminium enclosure.

FLOATS

Illustrated below is the standard float used with the Level Plus probe. A wide selection of other floats are available for such considerations as:

- **Material of construction**
- **Corrosion resistance**
- **Measuring interface level**
- **Density of product or interface liquid**



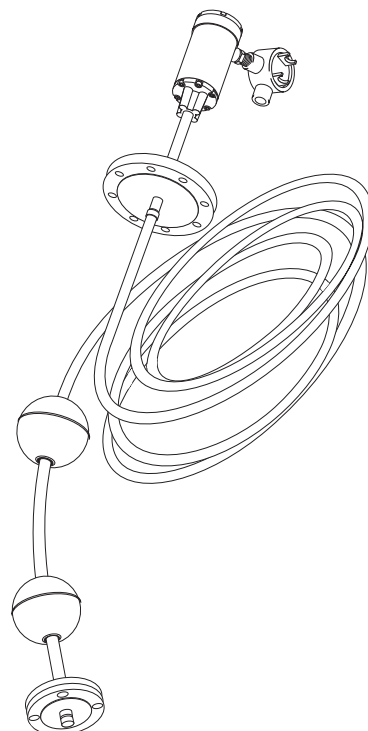
INSTALLATION

The LDF probe can be easily mounted through a top opening in a tank by means of a flange or plug. As standard the probe is supplied complete with 1" NPT compression fitting.

MAINTENANCE

The LDF probe utilises non-contacting magnetostrictive technology with the only moving parts being the float. This simple design ensures that any scheduled maintenance will be minimised.

- **3 MEASUREMENTS IN 1 PROBE**
Level, temperature and BSW
Measures all the necessary parameters for advanced inventory management
- **HIGH ACCURACY**
Provides improved inventory management with an accuracy that exceeds American Petroleum Institute (API) accuracy recommendations
- **FLEXIBLE PROBE SUITABLE FOR TANKS UP TO 60 FT (18M) HIGH**
Suitable for most vessel applications
- **DIGITAL EIA-485 (DDA PROTOCOL) COMMUNICATION**
Supports up to 20 probes on a single bus
Provides reduced installation & wiring costs





ANCILLARY EQUIPMENT

In order to ensure seamless system integration of the LDF probe, we are able to offer a range of field interface units and monitoring systems to suit most applications including the ability to interface with other manufacturers' equipment and systems.

PRODUCT ORDER CODES

LDF, FLEXIBLE MAGNETOSTRICTIVE PROBE

CODE A	UNITS OF MEASUREMENT
1	Inches
2	Millimeters
CODE B	GAUGE LENGTH
XXXX	Range: 120 to 720 inches (305 to 1829 cm), encode as 0120 to 0720 (0305 to 1829) 4-digit code represents measurement from tank flange to tank bottom plus 12 inches (30 cm)
CODE C	NUMBER OF RTD'S
1	1 RTD, always located 4 inches from tip of gauge
5	5 RTDs, equal spacing
6	5 RTDs, located per customer specifications (specify on Application)
CODE D	OUTER PIPE MATERIAL
2	316L Stainless Steel
CODE E	ANCHORING OPTION
1	Magnet
2	Weight
CODE F	ENGINEERED FEATURES
1	Standard, no engineered features
2	Custom engineering required (specify on Application)

LDF **A B C D E F**

When ordering or requesting a quotation from Whessoe Varec, choose options from suffixes to complete the order code. Please refer to separate data sheet for specific, non-standard float options.

LEVEL OUTPUT

Measured Variables:

Product level and BS&W level

Level Range:

10 to 60 ft. (3 to 18.3 m)

Level Accuracy:

0.005% F.S. or 0.020 in. (0.508 mm)

Level Hysteresis:

0.002% F.S. or 0.015 in. (0.381 mm)

Level Repeatability:

0.001 % F.S. or 0.005 in. (0.127 mm)

Level Resolution:

Up to ± 0.001 in. (0.025 mm)

TEMPERATURE OUTPUT

Measured Variable:

Averaging and multipoint temperature (up to 5 RTDs).

Temperature Range:

-30 to 160°F (-34 to 71°C)

Temperature Accuracy:

$\pm 0.5^\circ\text{F}$ ($\pm 1.0^\circ\text{C}$)

Temperature Resolution:

Up to $\pm 0.02^\circ\text{F}$ ($\pm 0.04^\circ\text{C}$)

ELECTRONICS

Input Voltage Range:

24 to 26 Vdc at safety barrier input

Reverse Polarity Protection:

Internal series diodes

Safety Approval:

FMRC and CSA Intrinsic Safety for Class I, II, III, Division 1, Groups C, D, E, F, G hazardous areas

CALIBRATION

Zero Adjust Range:

Software selectable along entire active gauge length.
No field adjust required

ENVIRONMENTAL

Enclosure:

O-ring sealed for outdoor use (NEMA 4)

Humidity:

0 to 100% R.H.

Operating Temperature:

Electronics: -40 to 149°F (-40 to 65°C)
Waveguide: -30 to 160°F (-34 to 71°C)

Vessel Pressure:

1.896 MPa maximum (275 PSIG)

Materials

Wetted: 316L stainless steel
Non-wetted: Epoxy painted aluminium

FIELD INSTALLATION

Length :

10-60 ft (3-18.3 m) excluding housing

Electronics housing:

3.75 in. (95.25 mm) diameter
x 8.56 in. (217.42 mm) long.

Condulet housing:

approximately 5 in. (127 mm) diameter

Tank Mounting:

1 in. NPT adjustable fitting

Wiring:

4 wire connections of shielded cable to screw terminals
through a 3/4 in. NPT conduit opening in condulet housing

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Rev. Mag-003-3-99

MAGNETOSTRICTIVE PROBES

AT A GLANCE

WHESSOE VAREC

Magnetostrictive Sensing Probe (MSP) offers a multiple parameter measurement instrument specially designed for the oil, gas and chemical industries.

The MSP is most suitable for clean and finished products such as fuel, diesel and propane at refineries, natural gas storage facilities, marine terminals and airport terminals

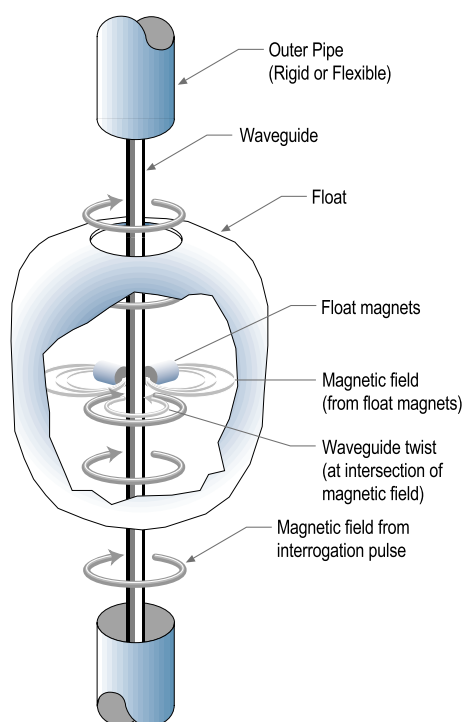
The Magnetostrictive Probe (MSP) offers both a precise and cost efficient method of measuring up to 3 parameters (level, temperature and BSW) using a single device. The probe is available in a rigid probe format which is ideally suited for small vessels and a flexible probe version for vessels greater than 7.6M (25 ft) high. All probes provide highly accurate continuous measurement for:

- **Level measurement**
- **Base sediment & water (BSW)**
- **Multi-spot temperature**

OPERATING PRINCIPLE

The Magnetostrictive probe (MSP) is composed of three concentric members. The outermost member is a protective outer pipe made from a product compatible material. The middle member is a tube which has resistive temperature devices (RTD's) mounted on it for accurate temperature monitoring.

The heart of the probe design is the innermost member, is the waveguide which is manufactured from a proprietary magnetostrictive material.



A low current interrogation pulse is generated in the gauge electronics and transmitted down the waveguide creating an electromagnetic field along the length of the wave guide. When this magnetic field interacts with the magnet contained with the float, a torsional strain pulse, or wave guide twist results which is detected as a return pulse. The time period between the initiation of the interrogation pulse and the detection of the return pulse is used to determine the level measurement with a high degree of accuracy +/- 0.5mm (0.02").

- **ONE PROBE – 3 MEASUREMENTS**
Provides the inputs required for complete and accurate inventory management.
- **EASY TO INSTALL**
Requires only one small vessel entry to install the probe
- **HIGH ACCURACY**
Provides improved inventory management with an accuracy that exceeds American Petroleum Institute (API) accuracy recommendations
- **FLEXIBLE PROBE OPTION**
Allow the probe to be utilised on vessels up to 18M (60ft) high.
- **NO MOVING PARTS – EXCEPT FLOAT**
Minimal maintenance required





For most versions of the MSP multiple spot bulbs can be incorporated within the probe, equally placed along the full length of the probe in order to obtain a true average temperature.

MATERIAL CONSTRUCTION

Using resilient lightweight materials, all wetted parts are constructed from of stainless steel as standard. The electronics housing is manufactured from a chemical resistant epoxy painted aluminium enclosure. The MSP probe is available with special material options such a Hastelloy, Monel and Teflon for aggressive products and extreme tank environments.

COMMUNICATIONS

The MSP can be used as a single measuring point or be fully integrated into a system. The probe is available in a number of communication options which include:

- 4-20mA analogue
- HART
- DDA Protocol (EIA-485)
- MODBUS
- PROFIBUS



FLOATS

In order to meet specific application requirements such as product specific gravity and operating pressure, a variety of floats are available. In practice the standard 1.85" (47mm) diameter 316L stainless steel float is suitable for most applications.

Please refer to separate data sheet detailing float options available and/or your local Whessoe Varec representative for assistance in selecting the correct float option for your needs.

SYSTEMS & ANCILLARIES

In order to ensure seamless system integration of the MSP probe, we are able to offer a range of field interface units and monitoring systems to suit most applications including the ability to interface with other manufacturers' equipment and systems.

MAINTENANCE

All versions of the MSP utilise non-contacting magnetostrictive technology with the only moving parts being the floats. This simple design ensures that any scheduled maintenance will be minimised.

LEVEL OUTPUT

Measured Variable

Product level, interface, temperature

Measuring Range

Flexible probe - 152 mm – 12.2M (0.5 – 40 ft)

Rigid probe - 152 mm – 7.6M (0.5 – 25 ft)

Typical Level Accuracy

Flexible - 0.005% F.S. or 0.508 mm (0.020 in)

Rigid - 0.025% F.S. or 0.794 mm (1/32 in)

Sensor Operating Temperature

-34 to 149°C (-30 to 300°F)

TEMPERATURE MEASUREMENT

Measured Variable

Averaging and multi-spot temperature (Up to 5 RTDs)

Temperature Range

-34 to 71°C (-30 to 160°F)

Typical Accuracy

+/- 1.0°C (+/-0.5°F)

ENVIRONMENTAL

Enclosure

Aluminium housing,
O-ring sealed for outdoor use
(IP 65, NEMA 4)

Humidity

0 to 100% R.H.

Electronics Operating Temperature

-40°C - 65°C (-40°F - 124°F)

Maximum Operating Pressure

1.896 Mpa (275 PSIG)

Materials

Wetted parts - Stainless steel
Non-wetted parts - Aluminium

Safety Approvals

FM & CSA
CENELEC (PTB)

Other Approvals

CE mark

FIELD INSTALLATION

Tank Mounting

3/4, 1 in NPT adjustable fitting or flange mounting

* To order a Magnetostrictive Probe please refer to the individual Technical specification sheets containing the product order codes.

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