ORION® INSTRUMENTS
A Magnetrol® Company

THE NEXT GENERATION OF MAGNETIC LEVEL INDICATION

MAGNETIC LEVEL INDICATORS

DESCRIPTION

Magnetically coupled liquid level indicators, or MLIs, are in widespread use throughout process industries. Originally designed as an alternative to sight and gauge glass devices, the MLI is now commonly used in both new construction and plant expansion.

ORION INSTRUMENTS® Atlas, Gemini, and Aurora® magnetic level indicators are precision engineered and manufactured to indicate liquid level accurately, reliably, and continuously. These units are completely sealed and require no periodic maintenance. MLIs also eliminate vapor or liquid emission problems common with sight and gauge glasses.

To complement these products, Orion produces a complete range of level switches and transmitters, including the Eclipse® Guided Wave Radar transmitter from Magnetrol International.

FEATURES

- Numerous chamber styles (or configurations) for each design. Custom designs available.
- Complete range of level switches and level transmitters, including Eclipse Guided Wave Radar
- Fabricated, non-magnetic chamber assembly produced in a wide range of metal and plastic materials
- ANSI and EN 1092 process connections available
- Precision manufactured float with internal magnets and magnetic flux ring
- Flag or shuttle type indicator with stainless steel scale to measure height, volume, or percentage of level
- Standard float stop springs at top and bottom of chamber
- Exceptional code qualified welding

APPLICATIONS

- Feedwater heaters
- Industrial boilers
- Oil/water separators
- Flash drums
- Surge tanks
- Gas chillers
- Deaerators
- Blowdown flash tanks
- Hot wells
- Vacuum tower bottoms
- Alkylation units
- Boiler drums
- Propane vessels
- Storage tanks

ATLAS & VECTOR MLI

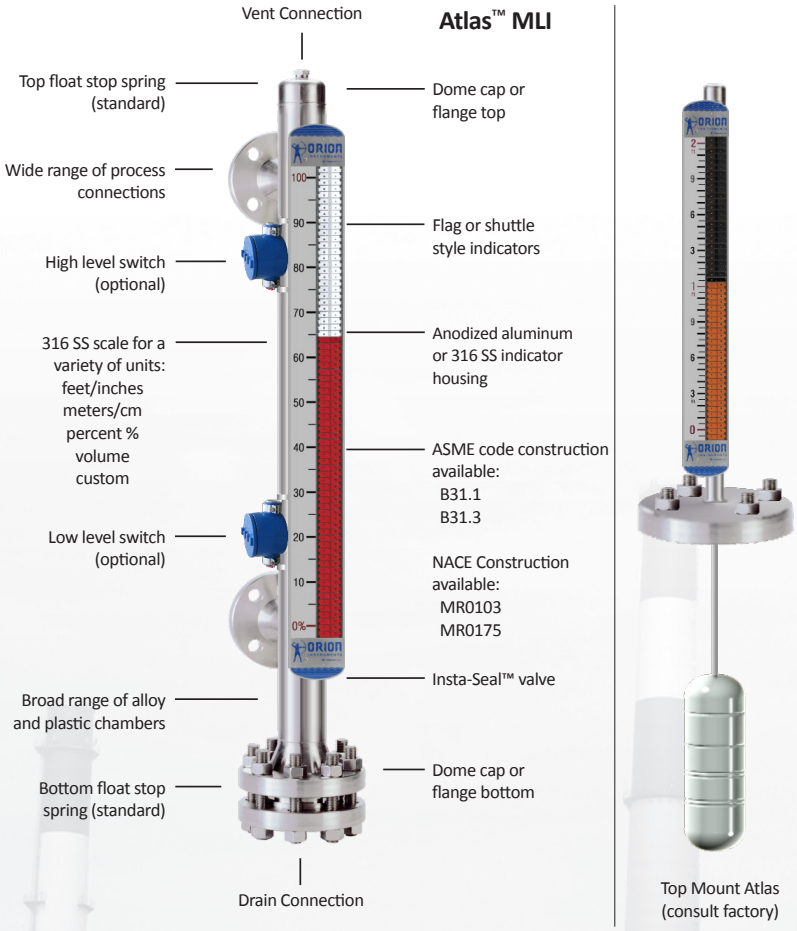
The Atlas is Orion's standard high-performance magnetic level indicator. Atlas is a single chamber design with either a 2", 2½", or 3" chamber diameter, as required by the application. There are twelve basic configuration styles including top mount models. Special configurations are also available.

Atlas MLIs are produced in a wide range of materials, including exotic alloys and plastics. Orion also offers the most complete selection of process connection types and sizes in the industry.

Atlas can be equipped with a variety of level transmitters and switches as well as flag and shuttle indicators with or without stainless steel scales. This enables the Atlas to be a complete level and monitoring control.

Vector™ (not shown) is a simple, rugged, reliable, and cost-effective Magnetic Level Indicator. Suitable for a variety of installations. VECTOR has many basic features and is precision engineered and manufactured to ensure a long service life.

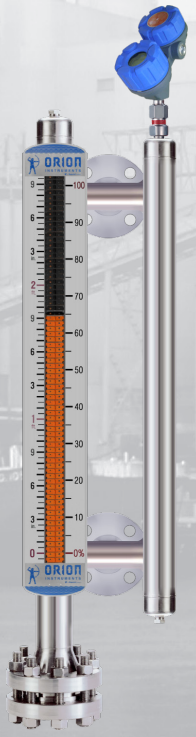
See bulletin ORI-140 for more information regarding VECTOR.



GEMINI

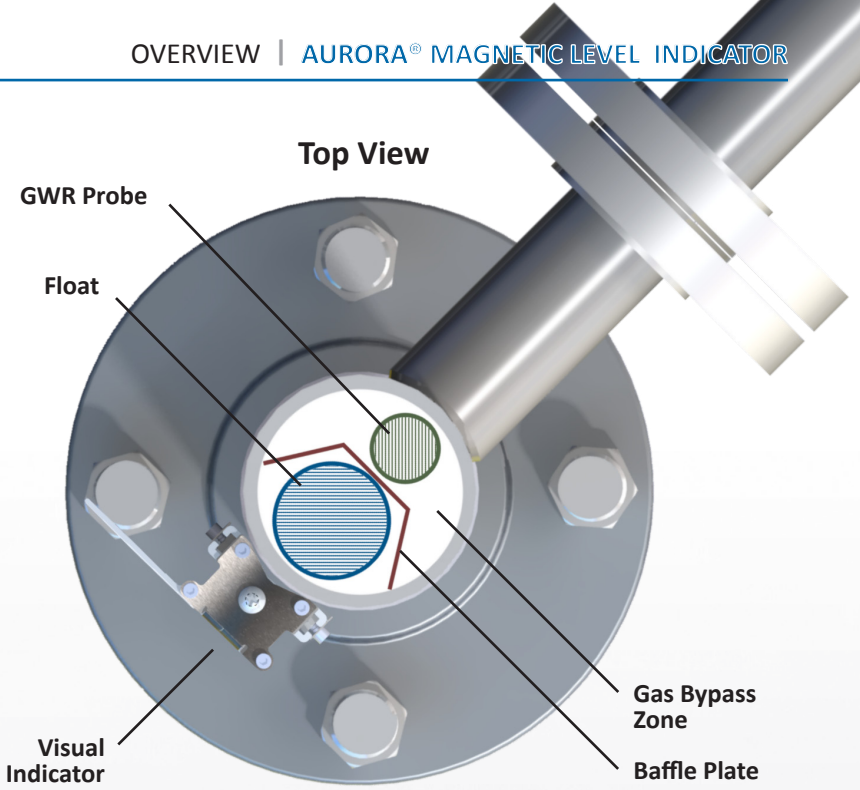
Orion's twin chamber design is unique to the Magnetic level gauge industry. Countless unique configuration styles are available with Gemini. It can be produced in the same metal material selections as Atlas.

The second chamber facilitates the installation of any of a wide selection of transmitters to provide continuous level monitoring in addition to the indication provided by the primary chamber. Eclipse guided wave radar, direct insertion Jupiter®magnetostrictive, or Kotron capacitance type level transmitters can be mounted in the secondary chamber to provide totally redundant indication with continuous level output. The primary chamber, which houses the float, can be fitted with clamp-on switches or transmitters for additional level control.



Aurora®

See Brochure ORI-101
for more information



Eclipse® GWR
Level Transmitter

DESCRIPTION

Aurora's patented design is the next generation of magnetic level indicators. It is state of the art and reflects Orion's innovation and commitment to magnetic level indicators.

Aurora is a totally redundant monitoring and control system. Liquid levels are tracked with great accuracy using two different technologies. An Eclipse® guided wave radar probe is housed along with the MLI float in a 3" or 4" diameter chamber. While the indicator relies upon the float and its internal magnets to activate the flags or shuttle, the Eclipse measures the liquid level directly. Two completely separate technologies in a single external chamber equal redundancy unlike any other MLI. The use of a special baffle within the chamber ensures that the float and Eclipse® probe work seamlessly and without interference.

There are ten basic configuration styles and over fifteen material selections for Aurora. For the first time ever, the ability to accurately and reliably measure ultra low dielectric media, high pressure/high temperature process conditions, and media with shifting and changing dielectric values can be accomplished with Aurora.

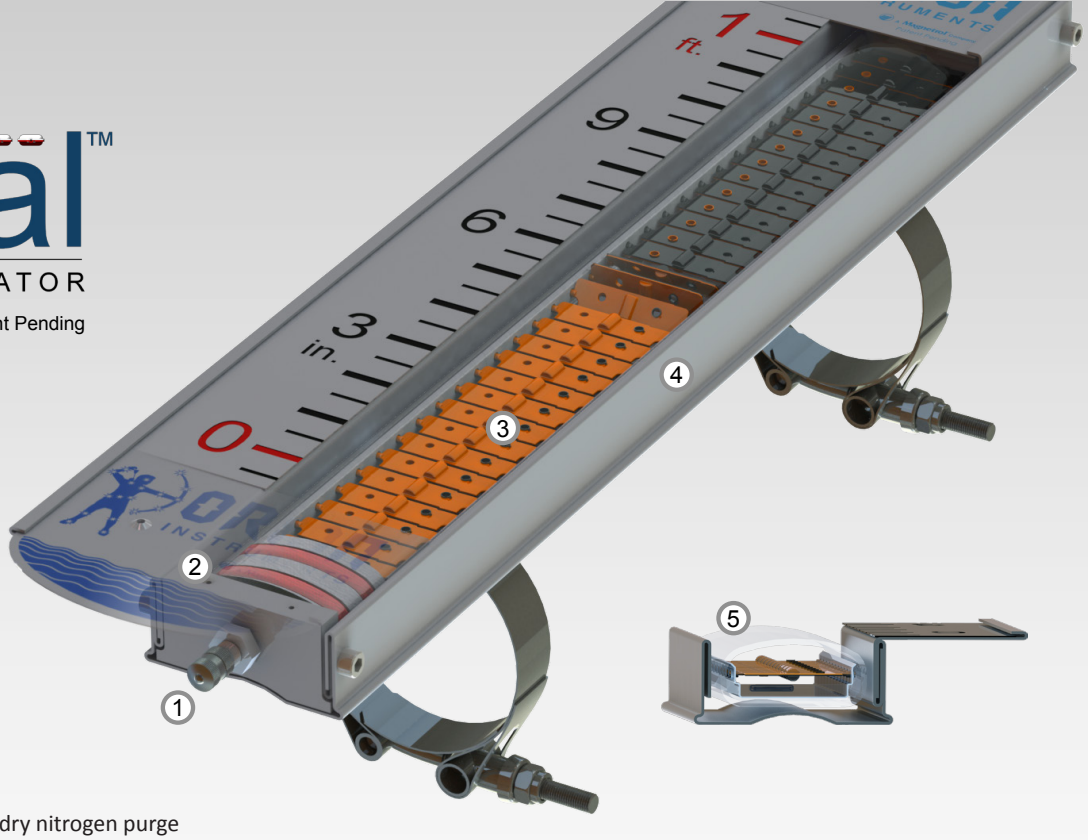
AURORA® FEATURES

- Wide range of alloy materials
- Eclipse available with HART®, FOUNDATION fieldbus™, or PROFIBUS™ communication
- Large selection of process connection options
- Eight probe designs cover a broad range of applications
- Eclipse transmitter available in 316 stainless steel or epoxy-coated aluminum
- ASME B31.1, B31.3, or NACE available; 150# to 2500# ANSI (PN 16 to PN 320)
- Top and bottom float stop springs

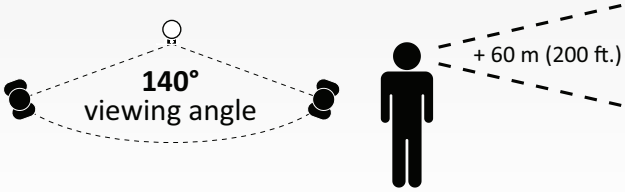
reveal™

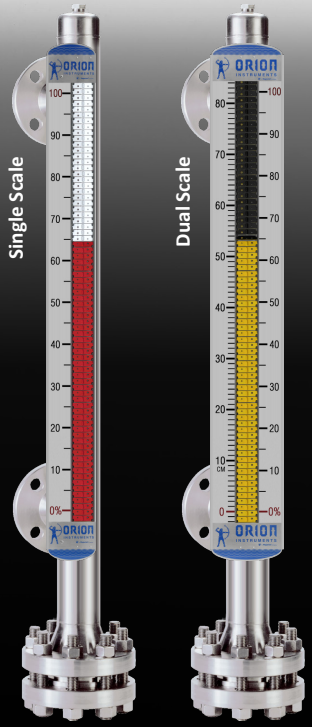
WIDE VIEW INDICATOR

Patent Pending



1. InstaSeal™ valve allows for an effective dry nitrogen purge
2. Double o-ring endplug ensures a reliable seal that keeps moisture out
3. All-metal high contrast powder coated or anodized flags are wider to enhance overall visibility
4. Robust 316 stainless steel enclosure designed to face the elements
5. Extruded shatter-resistant viewing window enhances visibility and allows the flags to position closely to the float, enhancing the magnetic coupling



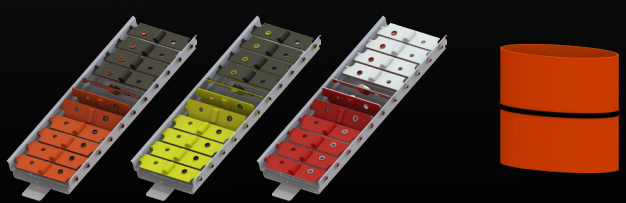


Scale Options:

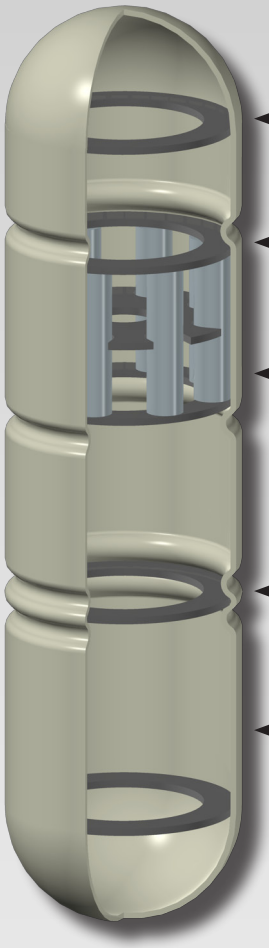
- Inches / Feet
- Running Inches
- Centimeters / Meters
- Percent (5% increments)
- Gallons
- Liters
- Barrels of Oil

REVEAL™ indicators incorporate a *positive-stop* design which limits the rotation of each flag to a half-turn. This eliminates "overflipping" which is commonly seen on other indicator designs.

Each flag contains a high-strength magnet



Standard flag and shuttle offering. Custom colors available.



Weld Ring: Secures float cap to main body

Flux Ring: Absorbs magnetic energy and directs it outward

Magnets: A full array surrounds the float with a strong and consistent magnetic field

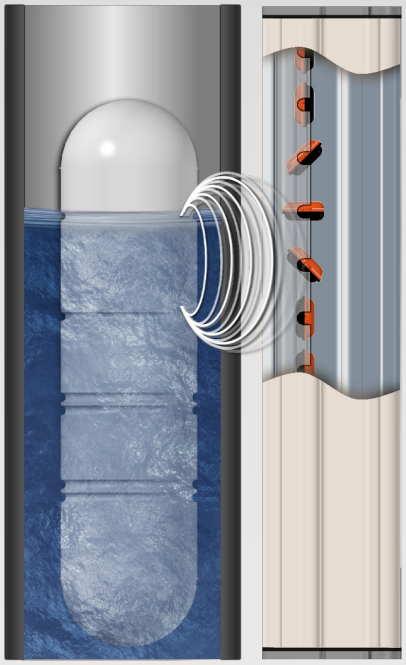
Support Ring: Provides reinforcement for the main float body

Float Body: Robust and durable construction delivers many years of reliable operation

ORION FLOAT TECHNOLOGY

The float contained within the magnetic level indicator is perhaps the most important element of the instrument. Its structural design, volume displacement, weight, and buoyancy force are all carefully considered when a float is specified for a particular application.

Orion engineers have designed and tested hundreds of floats to gather the most accurate data available. We have designs for thousands of unique applications around the world, including high pressure, high temperature, and interface.



The float's 360° magnet assembly produces a strong and consistent flux array allowing visual indication through chambers as thick as schedule 160.

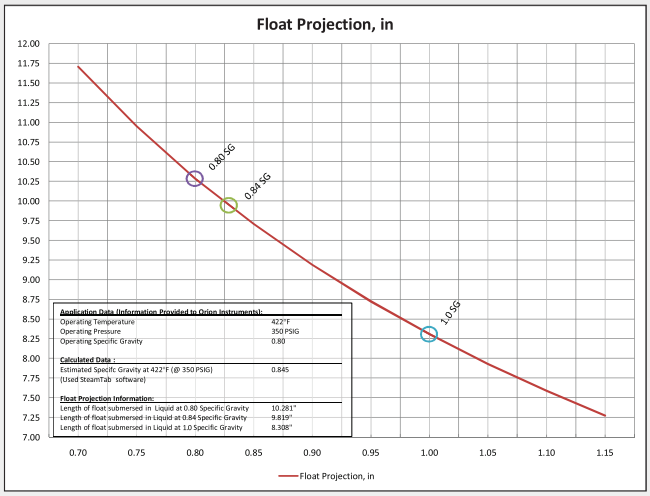
CAPABILITIES

- Process pressures up to 4,500+ psig (310 bar) ①
- Process Temperatures up to 1,000° F (538° C) ①
- Total level specific gravities as low as 0.25 ①
- Interface float designs available for liquid specific gravity differentials as little as 0.1
- Adequate buoyancy to operate effectively and freely in many viscous liquids, including crude oil

① maximum capabilities can vary depending on combination of pressure, temperature, and media specific gravity

OPTIONS

- Teflon-S® PTFE and PFA slip-assistant coating
- Halar® ECTFE Coating for abrasion and chemical resistance
- Float retrieval hook
- Float Projection Curve: If the liquid density changes, a float curve will reveal the offset →



Float Projection Curve

Design	Atlas, Aurora – single chamber	
	Gemini – dual chamber	
Materials of construction – MLI	Metal alloys	316/316L or 304/304L stainless steel,
		321 stainless steel, 347 stainless steel,
		Titanium, Monel, Hastelloy B,
		Hastelloy C-276, Inconel 625, Inconel 825,
		Alloy 20, Electropolished 316 stainless steel,
		904L stainless steel and other non-magnetic alloys
	Plastics / Composites	Fiberglass, PVC, CPVC, Kynar, polypropylene
Materials of construction – Float	varies per application - stainless steel and titanium are standard (exotic alloys available)	
Construction options	Conformance to Industrial Grade, ASME B31.1, ASME B31.3, and NACE available	
Certified material test reports (CMTR)	Available upon request	
Pressure class ratings	ANSI 150#, 300#, 600#, 900#, 1500#, 2500#	
	DIN PN16, PN25, PN40, PN63, PN100, PN160, PN250, PN320	
Process connection sizes	½" to 8"	
	DN 20 to DN 150	
Process connection types	MNPT, FNPT, Weldolet®, Sockolet®, threaded nipple, buttweld nipple, plain-end nipple,	
	slip-on flanges, weldneck flanges, lap joint flanges,	
	TriClamp® fitting, Van Stone flanges	
Measuring range	12 to 600 in (30 to 1524 cm)	
Temperature range	-320° to +1000° F (-196° to +538° C)	
Pressure range	Full vacuum to 4500 psig (310 bar)	
Specific gravity range	As low as 0.25 S.G. (consult factory for lower specific gravities)	
Visual Indicators	Magnetically actuated flag assembly in contrasting orange/black, yellow/black,	
	red/white colors, or high visibility shuttle follower (custom colors available)	
REVEAL™ Flag assembly seal	Inert gas filled and sealed with double o-ring & InstaSeal™ valve	
REVEAL™ visual indicator	Visible from 200 feet (61 meters)	
Aluminum visual indicator	Visible from 100 feet (30.5 meters)	
Scale options	Etched stainless steel with either height, volume, or percentage units (custom markings avail)	
Switch options	Model OES electric cam operated snap action (refer to Orion bulletin: OES-100)	
	Model ORS electric reed type (refer to Orion bulletin: ORS-300)	
	Pneumatic switch available (consult factory)	
Transmitter options	Model 705 Eclipse® guided wave radar (refer to Magnetrol bulletin: 57-101 & 57-102)	
	Model 2xx Jupiter® Magnetostrictive (refer to Orion bulletin: ORI-148)	
	Model OCT analog reed chain (refer to Orion bulletin: OCT-400)	
High temperature options	Electric or steam tracing with or without special high temperature insulation	
Low temperature options	Cryogenic insulation with special polymeric frost extension	

TRANSMITTER SPECIFICATIONS

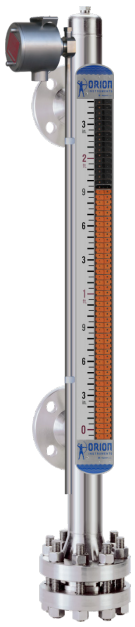
	Eclipse® Guided Wave Radar	Jupiter® Magnetostrictive
Measuring Range:	6 to 240 inches (15 to 610 cm)	6 to 400 inches (15 to 999 cm)
Resolution:	0.01 mA analog 0.1 inch (cm) display	0.01 mA analog 0.1 inch (cm) display
Repeatability:	<0.1 inch (2.5 mm)	±0.005% of full span or 0.005 inches (0.127 mm) (whichever is greater)
Non-Linearity:	<0.1% of probe length or 0.1 inch (2.5 mm) (whichever is greater)	0.020% of full span or 0.031 inches (0.794 mm) (whichever is greater)
Upper Dead Zone:	None	less than 3 inches (7.6 cm) when bottom mounted electronics
Lower Dead Zone:	None	less than 3 inches (7.6 cm) when top mounted electronics
Damping:	0 - 10 seconds; adjustable	0 - 25 seconds; adjustable
Power (at terminals):	GP/IS: 11 to 28.6 VDC EP (with IS probe): 13.5 to 28 VDC Foundation fieldbus™ & PROFIBUS PA™(FISCO): 9 to 17.5 VDC Foundation fieldbus™ & PROFIBUS PA™(FNICO Exd): 9 to 32 VDC	HART®: 12 to 28 VDC Foundation fieldbus™ Explosion Proof: 9 to 17.5 VDC FISCO/FNICO: 9 to 17.5 VDC
Signal Output:	4-20 mA with HART®: 3.8 to 20.5 mA usable Foundation fieldbus™: H1 (ITK Ver. 5.01) PROFIBUS PA™: PROFIBUS PA™ H1	4-20 mA with HART®: 3.8 to 20.5 mA usable Foundation fieldbus™: H1 (ITK Ver. 4.61)
Display:	2 line x 8 character LCD	2 line x 8 character LCD
Housing Material:	IP66/Aluminum A356T6 or 316 SS	NEMA 4X/7/9IP66/Aluminum A356T6 or 316 SS
Area Classifications:	FM/CSA/ATEX/IEC - EP, IS, NI (see specific product literature for more detail)	FM/CSA/ATEX/IEC/INMETRO - EP, IS, NI (see specific product literature for more detail)
Safety Integrity Level:	Standard Electronics: SIL 1 as 1oo1, SFF 85.4% Enhanced Electronics: SIL 2 as 1oo1, SFF 91%	Standard Electronics: SIL 1 as 1oo1, SFF 83.7% Enhanced Electronics: SIL 2 as 1oo1, SFF 90.7%
Process Temperature:	probe dependent (see specific product literature for more detail)	External Mount: -320° F to +850° F (-195 to 455° C) *with insulation Direct Insertion: -320° F to + 500° F (-195 to 260° C)
Ambient Temperature at Electronics:	-40° to 175° F (-40° to 80° C) LCD: -5° to +160° F (-20° to +70° C)	-40° to 175° F (-40° to 80° C) LCD: -10° to +160° F (-20° to +70° C)
Process Pressure:	probe dependent (see specific product literature for more detail)	Direct insertion: +1700 psig (117 bar) (see specific product literature for more detail)
Mounting Arrangement:	Direct insertion probe with integral mount or remote mount electronics	Direct insertion probe with integral mount or external top or bottom mount on MLI

TRANSMITTER SPECIFICATIONS

	OCT Reed Chain
Measuring Range:	6 to 198 inches (15 to 503 cm)
Resolution:	±0.50 inches (13 mm)
Repeatability:	< 0.25 inches (6 mm)
Non-Linearity:	<0.4% full span averaged over span
Upper Transition Zone:	4 inches (10.2 cm)
Lower Transition Zone:	4 inches (10.2 cm)
Power Input:	12 to 36 VDC
Signal Output:	4 to 20 mA
Housing Type:	NEMA 4X, IP66
Housing Material:	Cast Aluminum or 316 SS
Area Classifications:	FM/CSA EP
Process Temperature:	-40° to +425° F (-40° to +218° C)
Ambient Temperature at Electronics:	-40° to +158° F (-40° to +70° C)
Mounting Arrangement:	External mount probe with integral top or bottom mounted electronics

Eclipse®

Jupiter®
on Atlas™



OCT
on Atlas™

ELECTRONIC SWITCH SPECIFICATIONS		
Model:	OES	ORS
Description:	SPDT magnetically actuated, bi-stable cam drive snap action switch	Hermetically sealed bi-stable reed switch
Supply Voltage:	250V AC/DC max	150V AC/DC max
Maximum Dead Band:	±0.75" float travel	±0.50" float travel
Temperature Range:	-58° to +392° F (-50° to +200° C)	-58° to +482° F (-50° to +250° C)
Enclosure Rating:	NEMA 4X	NEMA 4X
Enclosure Material:	Cast aluminum (standard)	Stainless steel

Model OES

Model ORS

PNEUMATIC SWITCH SPECIFICATIONS

consult factory for more information regarding pneumatic switches

Agency	Model	Area Classification
FM FM APPROVED	OES-xxxx-001	Class I, II, III, Div. 1, Groups B,C,D,E,F,G; T6 @ 80°C; Type 4X
	ORS-xxxx-001	Class I, II, III, Div. 1, Groups B,C,D,E,F,G; T6 @ 80°C; Type 4X Class I, Div. 2, Groups A, B, C, & D; T6 @ 80°C
	OCT-xxxx-xxx	Class I, II, III, Div. 1, Groups B,C,D,E,F,G; T6 @ 80°C; Type 4X Class I, Div. 2, Groups A, B, C, & D; T6 @ 80°C
CSA	OES-x1xx-001	Class I, Div. I/II, Groups B, C, & D; T6 @ 80°C; Type 4X Class II, Groups E, F, & G;T6 @ 80°C; Type 4X Class III
	ORS-x1xx-001 OCT-xxxx-001	Class I, Div. I, Groups B, C, & D; T6 @ 80°C; Type 4X Class I, Div. II, Groups A, B, C, & D; T6 @ 80°C; Type 4X Class II, Groups E, F, & G; T6 @ 80°C; Type 4X Class III
ATEX	ORS-xAxx-001	ATEX II 2 G Ex d IIC T6 Ta = -40 to +70° C
IEC IECEx	ORS-xAxx-001	IECEx d IIC T6 Ta = -40 to +70° C
CE CE	OES-xxxx-001 ORS-xxxx-001 OCT-xxxx-xxxx	Low Voltage Directives, 2006/95/EC Installation Category II, Pollution Degree 2

Agency	Model	Protection Method	Area Classification
FM	705-5XXX-1XX 705-5XXX-2XX	Intrinsically Safe	Class I, Div. 1, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G T4 Class III, Type 4X, IP66 Entity
	705-5XXX-3XX 705-5XXX-4XX	Explosion Proof ① (with Intrinsically Safe probe)	Class I, Div. 1, Groups B, C, & D Class II, Div. 1, Groups E, F, & G T4 Class III, Type 4X, IP66
	705-5XXX-XXX 705-5XXX-XXX	Non-Incendive Suitable for: ②	Class I, Div. 2, Groups A, B, C, & D Class II, Div. 2, Groups F & G T4 Class III, Type 4X, IP66
CSA	705-5XXX-1XX 705-5XXX-2XX	Intrinsically Safe	Class I, Div. 1, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G T4 Class III, Type 4X Entity
	705-5XXX-3XX 705-5XXX-4XX	Explosion Proof ① (with Intrinsically Safe probe)	Class I, Div. 1, Groups B, C, & D Class II, Div. 1, Groups E, F, & G T4 Class III, Type 4X
	705-5XXX-XXX 705-5XXX-XXX	Non-Incendive Suitable for: ②	Class I, Div. 2, Groups A, B, C, & D Class II, Div. 2, Groups E, F, & G T4 Class III, Type 4X
ATEX	705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe ③	Ex II 1G, EEx ia IIC T4 FISCO
	705-5XXX-CXX 705-5XXX-DXX	Flame Proof	Ex II 1/2G, EEx d [ia] IIC T6
	705-51XX-EXX 705-51XX-FXX 705-52XX-EXX 705-52XX-FXX	Non-sparking	Ex II 3(1)G, EEx nA [ia] IIC T4..T6 with probe II 1 G EEx ia IIC T6 Ex II 3(1)G, EEx nA [nL] [ia] IIC T4..T6 with probe II 1 G EEx ia IIC T6
IEC	705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe ③	Zone 0 Ex ia IIC T4 FISCO

CE 0344

These units are in conformity of:

1. The EMC Directive: 2004/108/EC. The units have been tested to EN 61326.
2. Directive 94/9/EC for equipment or protective system for use in potentially explosive atmospheres.

Note: Single and twin rod probes must be used in metallic vessel or stillwell to maintain CE compliance.

① Factory Sealed: This product has been approved by Factory Mutual Research (FM), and Canadian Standards Association (CSA), as a Factory Sealed device.

② **IMPORTANT:** Measured media inside vessel must be non-flammable only. If media inside vessel is flammable, then the explosion proof version (which contains an internal barrier making the probe Intrinsically Safe) is required.

③ Special conditions for safe use
Because the enclosure of the Guided Wave Radar Level Transmitter Eclipse Model 705-5_ _ _-_ 1 _ and/or Probe Eclipse Model 7_ _-_ _ _ _-_ _ _ is made of aluminum, if it is mounted in an area where the use of category 1 G (Zone 0) apparatus is required, it must be installed such, that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

For applications in explosive atmospheres caused by gases, vapours or mists and where category 1G (Zone 0) apparatus is required, electrostatic charges on the non-metallic parts of the Probe Eclipse Model 7x5-_ _ _ _-_ _ _, Model 7x7-_ _ _ _-_ _ _ , and Model 7_F-_ _ _ _-_ _ _ shall be avoided.

Agency	Model	Protection Method	Area Classification
FM & CSA	2xx-1xxx-xxxxx-xxx	Intrinsically Safe	Class I, Div. 1, Groups A, B, C, & D, T4 Ta @ 80°C Class II, Div. 1, Groups E, F, & G; Class III, T4 Ta @ 80°C IP66 TYPE 4X Entity
	2xx-3xxx-xxxxx-xxx	Explosion Proof ①③	Class I, Div. 1, Groups B, C, & D, T5 Ta @ 80°C Class II, Div. 1, Groups E, F, & G; Class III, T5 Ta @ 80°C IP66 Type 4X
	2xx-1xxx-xxxxx-xxx 2xx-3xxx-xxxxx-xxx	Non-Incendive ④	Class I, Div. 2, Groups A, B, C, & D, T5 Ta @ 80°C Class II, Div. 2, Groups E, F, & G②; Class III, T5 Ta @ 80°C IP66 Type 4X T5
ATEX	2xx-Axxx-xxxxx-xxx	Flame Proof	Ⓔx II 1/2 G EEx d IIC T6 @ 70°C
	2xx-Exxx-xxxxx-xxx	Intrinsically Safe	Ⓔx II 1 G EEx ia IIC T4 @ 70°C FISCO
IEC	2xx-Jxxx-xxxxx-xxx	Flame Proof	Ex d IIC T6 @ 70°C
	2xx-Kxxx-xxxxx-xxx	Intrinsically Safe ⑤	Ex ia IIC T4 @ 70°C Ga FISCO
INMETRO	2xx-Lxxx-xxxxx-xxx	Flame Proof	Br- Ex d IIC T6 @ 70°C, IP66W
	2xx-Mxxx-xxxxx-xxx	Intrinsically Safe ⑤	Br-Ex ia IIC T4 @ 70°C, IP66W FISCO

CE 0344

These units are in conformity of:

1. The EMC Directive: 2004/108/EC. The units have been tested to EN 61326.
2. Directive 94/9/EC for equipment or protective system for use in potentially explosive atmospheres.

① M20 conduit connections not CSA approved explosion proof

② FM approval class II, Div. 2 Groups F & G only

③ Factory Sealed: This product has been approved by Factory Mutual Research (FM), and Canadian Standards Association (CSA), as a Factory Sealed device.

④ **IMPORTANT:** Measured media inside vessel must be non-flammable only. If media inside vessel is flammable, then the explosion proof version (which contains an internal barrier making the probe Intrinsically Safe) is required.

⑤ **Special conditions for safe use**
Materials marked as category 1 equipment and used in hazardous areas requiring this category, shall be installed in such a way that, even in the event of rare incidents, the aluminum enclosure cannot be an ignition source due to impact or friction.

ADDITIONAL CERTIFICATIONS

GOST R Russian Certificate of Conformity
GOST Pattern Approval Certificate for Measuring Instruments (Metrology Certificate)
GOST R Ex-Proof Certificate of Conformity

orionxpress shipment program

Orion Instruments is dedicated to reducing product lead times through ongoing efficiency initiatives and strategic inventory management. *OrionXpress* is available for select product configurations and will allow your product to ship within 3 weeks of placing the order.

Look for the blue shaded options throughout the model number: E Example

some restrictions apply

ORION INSTRUMENTS

2105 Oak Villa Boulevard • Baton Rouge, Louisiana 70815 • 225-906-2343 • Toll Free 866-55-ORION (866-556-7466) • Fax 225-906-2344 • www.orioninstruments.com

Copyright © 2012 Orion Instruments, LLC. All rights reserved. Printed in the USA.
Performance specifications are effective with date of issue and are subject to change without notice.

Orion, Orion logotype, Magnetrol, Magnetrol logotype, Aurora, Jupiter, and Eclipse are registered trademarks of Magnetrol International, Inc.
Atlas, Gemini, and Vector are trademarks of Magnetrol International, Inc.
HART® is a registered trademark of the HART Communication Foundation.
Foundation fieldbus™ is a trademark of Fieldbus Foundation.
Hastelloy® is a registered trademark of Haynes International.
Monel® is a registered trademark of the INCO family of companies.
Teflon® is a registered trademark of DuPont.
Halar® is a registered trademark of Solvay Solexis S.p.A.
Tri-Clamp® is a registered trademark of Ladish Company.

Registered to ISO 9001:2008
BULLETIN: ORI-138.4
EFFECTIVE: JULY 2012