



ORION
INSTRUMENTS
A  Magnetrol Company

THE NEXT GENERATION IN MAGNETIC LEVEL INDICATION

Aurora[®]



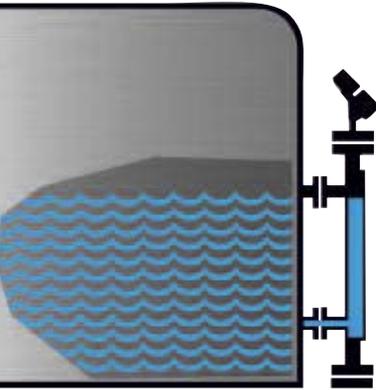
FEATURING:

ECLIPSE[®]
GUIDED WAVE RADAR



True Redundancy in a Single Chamber

The Aurora Magnetic Level Indicator (MLI) combines Eclipse® Guided Wave Radar (GWR) and a float-actuated visual indicator to simultaneously provide both continuous and local level indication. So unique is Orion's dual redundancy within a single chambered MLI that Aurora has been granted a U.S. patent.



Why an MLI?

The Magnetic Level Indicator is an alternative to leakage-prone sight glasses, a traditional but fragile means to achieve visual indication of liquid level.

Unlike hard-to-read sight glasses, Aurora's visual indicator is highly visible. Maintenance on the MLI, its transmitter and switches (if so equipped), can be accomplished without breaching the vessel.



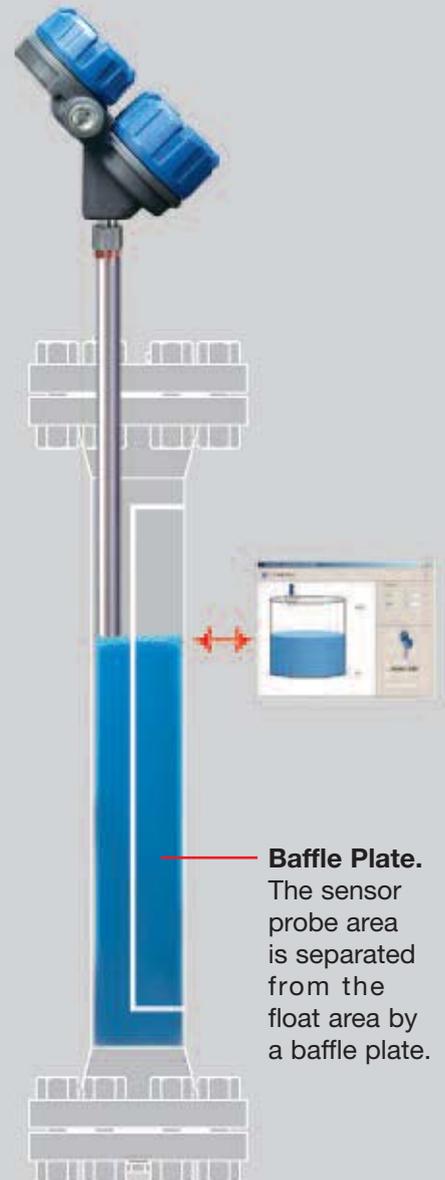
Introduced in 1998, Eclipse Guided Wave Radar quickly ascended to its leading role in process level measurement. GWR is favored for its easy set up, trouble-free operation, measurement accuracy, and adaptability to a wide range of conditions.

Aurora's single chamber houses the Eclipse sensor probe and a buoyancy float, the former providing continuous measurement and the latter magnetically coupled to a visual indicator to provide local level indication.

A flag-type indicator (or a moving shuttle) visually indicates liquid level. A variety of measurement scales and indicator flag colors are available.

Technology #1 Radar Transmitter

The Eclipse transmitter continuously emits electromagnetic radar pulses directly off the liquid surface. The on-board electronics provide a real-time level output, in addition to the external visual indicator operated by Aurora's internal float.

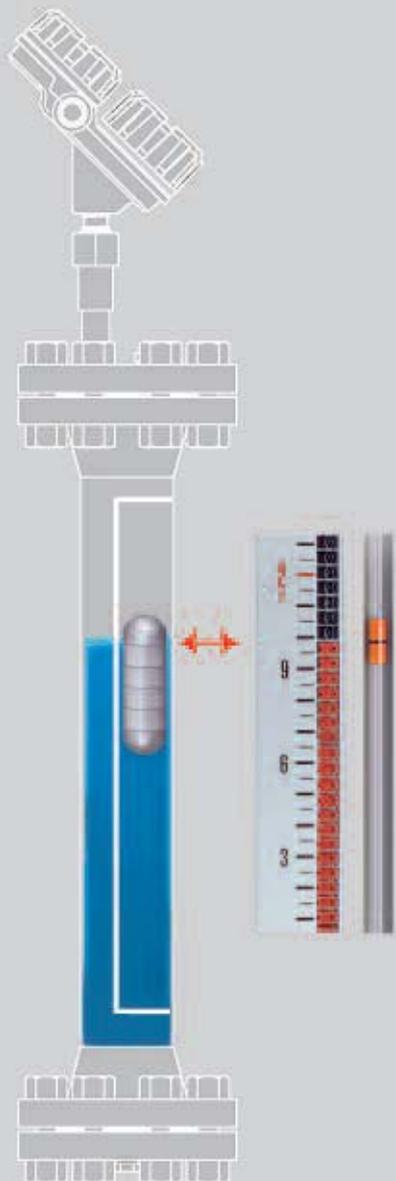


Baffle Plate. The sensor probe area is separated from the float area by a baffle plate.

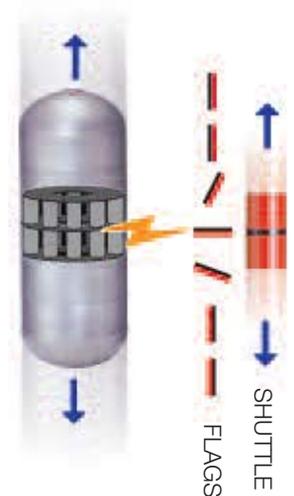


Technology #2 Vertical Float

The custom float located inside the chamber is magnetically coupled to the visual indicator. The float rotates flags or moves a shuttle to indicate liquid tank level (as explained in more detail at right).



Visual Indication. The float positioned within Aurora’s chamber moves up and down according to level changes. The float contains an internal group of magnets that are “coupled” with magnets in the flags of the visual indicator. As the float moves, the flags rotate to expose the color of their opposite side. The position where the flag’s color changes corresponds to a point on the measuring scale indicating true level. (The optional shuttle indicator moves parallel with the float to indicate level on the scale).



Optimum Float Performance.

The Orion float has been engineered to provide the world’s best MLI performance.

- The 360-degree vertical placement of the magnets assures proper coupling with the flag or shuttle of the indicator, even if the float is spinning in its chamber.
- The magnetic assembly creates a constant Gauss rating optimized to ensure reliable performance.
- Float magnets are designed to function at temperatures up to +1000° F (+537° C) for years of reliable service. Special float alloys are available (see page 10).



FLOAT SECTION

Baffle Plate. Aurora’s superb float performance is due in part to an angled baffle plate mounted inside the chamber. The baffle plate ① partitions the sensor probe area ② from the float area ③ and serves as a guide to ensure smooth float travel and proper indicator operation. Perforations along the baffle plate equalize pressure and allow free media flow within the chamber. The probe area ② also acts as a gas-bypass zone when flashing occurs. This helps in preventing damage to the float.



CHAMBER SECTION

The Eclipse Transmitter

4.



Description: The Eclipse Model 705 is a two-wire, loop-powered, 24 VDC liquid level transmitter based on the revolutionary Guided Wave Radar (GWR) technology. The Model 705 can be used with all coaxial and single rod probes specified for Aurora (see page 5). Eclipse is designed to provide measurement performance well beyond that of many traditional technologies.

Measurement Principle:

Guided Wave Radar is based upon Time Domain Reflectometry (TDR). Pulses of electromagnetic energy are transmitted down the probe and reflected when they reach a liquid surface.

Features:

- Measures low dielectrics
- Volumetric output
- Quick connect/disconnect probe coupling.
- IS, XP, and Non-Incendive approvals

Options:

- FOUNDATION fieldbus™ digital output
- PROFIBUS PA® digital output
- LCD display and three-button keypad
- Choice of coaxial and single rod probes
- Aluminum or Stainless Steel enclosures
- Remote-mounted electronics



Power	24 VDC
Range	6 to 240 inches (15 to 610 cm)
Display	2-line x 8 character LCD
Resolution	Analog: 0.01 mA Digital: 0.01 units
Output	4–20 mA with HART® digital communication (FOUNDATION fieldbus™ or PROFIBUS PA® optional)
Response	Less than 1 second
Temp Range	-40° to +800° F (-40° to +430° C)
Enclosure	NEMA 4X/7/9/IP 67 rating
Process Seal	Complies with ISA 12.27.01
Sensor	316 Stainless Steel, Hastelloy C®, or Monel®



The wiring compartment (top) is safely separated from the electronics compartment (bottom). Simulated readout

Why Eclipse?



Contact Measurement:

Eclipse contacts the process directly, returning its signal from actual product level.



Low Maintenance:

Eclipse is 100% electronic with no moving parts to wear out or replace.



E-Z Configuration:

Simple configuration replaces calibration. GWR is bench configurable.



Ergonomic Design:

Eclipse is compact and its user interfaces are very easy to use.



Media Savvy:

Eclipse tolerates high temp and pressure, steam, coating, acids, most foams, visible vapors, changing specific gravities and dielectrics.

Transmitter Probe Selection

Choosing the right probe is among the most important decisions in the specification process because the probe establishes the fundamental performance characteristics unique to the application.

COAXIAL



SINGLE ROD

7XJ: HTHP (High Temperature/High Pressure) Single Rod
7X1: Flexible Single Rod

Coaxial and Single Rod Sensor Probes

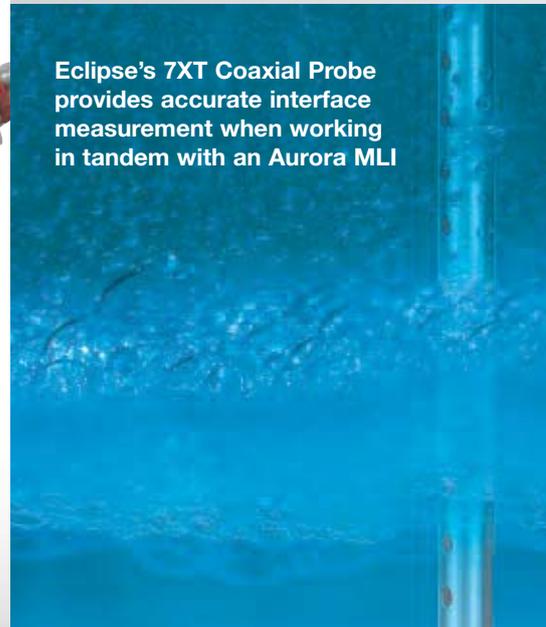
Eclipse accommodates a number of coaxial and single rod probes to satisfy the broadest range of application needs for Aurora that include general purpose probes and those designed for optimum performance in high pressure, high temperature, saturated steam and interface measurement.

The **coaxial probe** is the most efficient of all probe configurations. Analogous to the efficiency of modern coaxial cable, a coaxial probe allows an almost unimpeded movement of the high frequency pulses.



The **single rod probe** is most efficient where viscous media builds-up on the probe (left). The dynamics of the single rod radar signal is such that it will read level off the actual liquid surface rather than the top of the build-up. The single rod probe is effective in many heavy crude and hydrocarbon applications.

Eclipse's 7XT Coaxial Probe provides accurate interface measurement when working in tandem with an Aurora MLI



6. Aurora Applications

Suitable for a wide range of tanks, liquids, and conditions



From routine to critical applications, Aurora measures a wide range of liquids in a broad array of vessels and process conditions. With its robust construction, its ability to measure continuous or interface level, and its tolerance for harsh conditions, Aurora is ideal for the toughest industrial challenges. Aurora provides accurate measurement in environments with wide temperature and pressure swings, cryogenic temperatures, and vibration. It measures liquids that are aggressive, environmentally toxic, noxious to personnel, flammable or explosive, and with low dielectric constants.

| Onshore/Offshore Oil & Gas | Thermal & Nuclear Power | Pharmaceutical & Biotech | Refining | Petrochem | Wastewater | Chemical Processing

Aurora at Work

Common Applications:

- Alkylation Tanks
- Blowdown Tanks
 - Boiler Drums
- Condensation Tanks
 - Deaerators
- Feedwater Heaters
 - Flash Drums
 - Gas Chillers
 - Hot Wells
- Industrial Boilers
- Oil-Water Separators
- Propane Vessels
 - Storage Tanks
 - Surge Tanks
- Vacuum Towers



Dehydration Vessel



Steam Drum

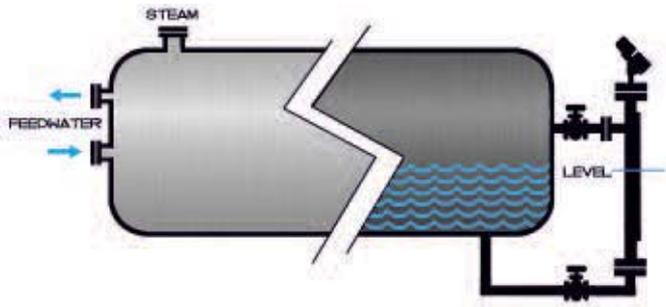


Storage Tanks

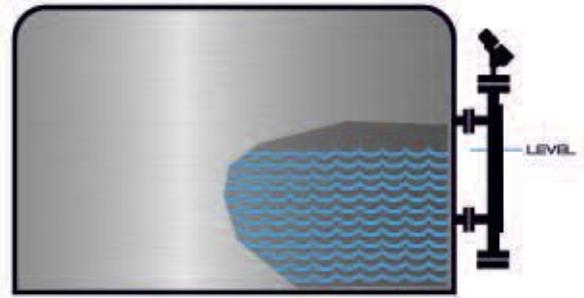


Fermentation Vessel

Aurora's Most Common Tank Configurations:



SIDE / BOTTOM
Shown on a feedwater heater



SIDE MOUNT
Shown on a storage tank



BioPharm Vessel



Surge Drum



Neutralization Tank



Alkylation Tank



Oil & Gas Platform



Fuel Oil Storage

8. Aurora Accessories

See page 10 for standard and custom options

Switches

- Precision engineered switches enhance the monitoring & control capabilities of Aurora. Available as snap action, pneumatic, or bi-stable reed switches.



OES-100

Transmitters

- For critical applications where measurement by multiple technologies is essential, Orion offers optional transmitters for level monitoring with the highest degree of scrutiny. A Jupiter® magnetostrictive transmitter is often used with Aurora's Eclipse radar.



OCT-400

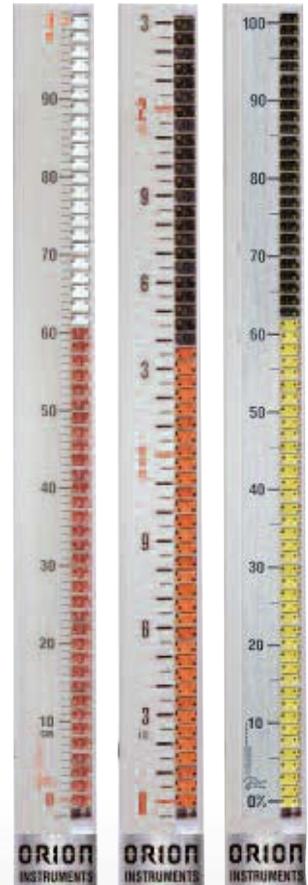
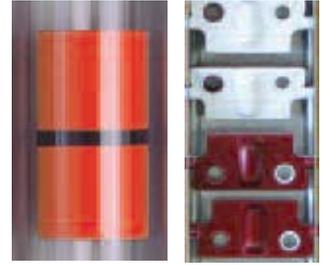
Thermal Gear

- High temperature and cryogenic thermal insulation blankets protect MLIs from temperature extremes.
- Steam tracing or electrical heat tracing is available with or without insulation blankets.
- For cryogenic applications, visual indicator extension housings help maintain readability by preventing ice accumulation on the indicator.



Visual Indicators

- Choose from shuttle type or flag type visual indicators.
- Scales are available in English or Metric, with volumetric or percentage scales, in different colors, and in stainless steel construction.



Protocols

Aurora utilizes the latest in communications protocols including HART, FOUNDATION fieldbus and PROFIBUS PA digital communication. Eclipse GWR can be equipped to detect overall level or interface level, and when used with a HART splitter, it can transmit two 4–20 mA signals.



Diagnostics

Eclipse utilizes PACTware™ software, a device-independent graphics interface that enables remote viewing of level position, review and configuration of all parameters, trending data (such as level, quality, loop, % output) and all diagnostic conditions of the transmitter.



Approvals

The Eclipse 705 transmitter has Intrinsically Safe, Explosion Proof, and Non-Incendive approvals (CSA, FM, IEC); and Intrinsically-Safe, Flame Proof and Non-Sparking approvals (ATEX). Eclipse is available with a Safety Integrity Level (SIL) 2 hardware suitability rating.

- Intrinsically Safe
- Explosion Proof
- Non-Incendive



Worldwide Applications

Orion has accumulated vast application knowledge and thousands of installations on six of seven continents, and in many seas, gulfs and oceans. Orion's direct-support offices around the world provide customers with applications assistance.



Custom MLIs for your most demanding application challenges

From routine material options to one-off custom fabrications, Orion will build the Aurora MLI to suit the precise needs of your critical application. From developmental engineering to MLI commissioning

assistance, we'll oversee the realization of that special, one-of-a-kind solution. Contact your Orion representative when you need an Aurora with capabilities beyond the standard options.

Aurora's Standard Options:

Chamber

- Standard and custom chamber-mounting configurations
- 15 different standard chamber materials
- ANSI and DIN pressure ratings
- 3" or 4" chamber diameters
- Multiple process connection sizes and types
- Chamber and flange insulation options

Floats

- Float materials include metallics, plastics, and composites such as fiberglass
- Several materials available, including exotic alloys offering increased corrosion resistance
- High Pressure designs available
- Magnetic Trap option prevents ferromagnetic particles in a vessel from entering the chamber and interfering with float movement

Level Indication

- Flag or Shuttle indicators
- Choice of high-contrast flag colors
- 12 different measuring scales including English or Metric, with volumetric or percentage scales
- Optional stainless steel scale construction.
- Optional Gauge Glass mounted to side of chamber
- Local LCD enables users to view configuration parameters, error messages, and live process variable data

Eclipse

- Liquid Crystal Display
- HART, FOUNDATION fieldbus, or PROFIBUS PA digital communications
- A selection of sensor probe types and materials
- Aluminum or Stainless Steel transmitter housings
- PACTware Diagnostic Software

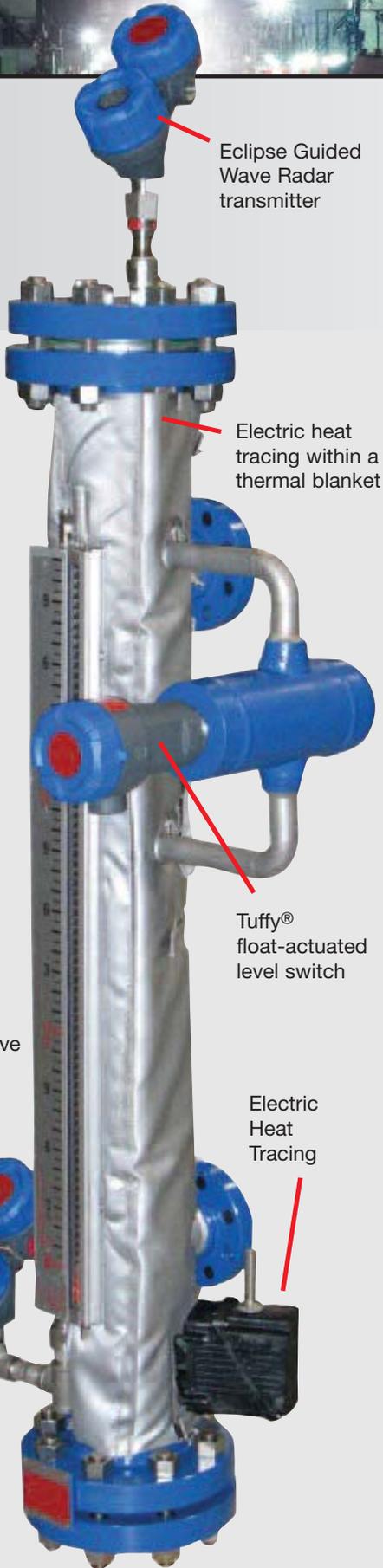
Accessories

Aurora MLIs may be equipped with blankets, steam or electric heat tracing, and frost extensions for cryogenic applications. Additional transmitters include Reed Chain and Magnetostrictive technologies. Switch options include electro-magnetic and pneumatic switches.



Left: A triple-redundant Aurora fitted with three transmitters and special cryogenic insulation.

Right: A custom Aurora with a Magnetrol Tuffly® level switch, insulation blanket, heat tracing, and Jupiter Magnetostrictive transmitter.



Eclipse Guided Wave Radar transmitter

Electric heat tracing within a thermal blanket

Tuffy® float-actuated level switch

Jupiter Magnetostrictive transmitter

Electric Heat Tracing



An Orion technician activates PACTware on a drilling rig.

◆ Need more Orion MLI information? Download these informative brochures at orioninstruments.com

Eclipse Installation and Operating Manual

This 68-page handbook is the official installation and operating guide for Eclipse Guided Wave Radar transmitter.



Jupiter Transmitter

This 12-page brochure describes the technology, key features, applications and specifications of the Jupiter Magnetostrictive transmitter.



THE POWER OF INNOVATION



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