



Eclipse® Enhanced Model 705 Guided Wave Radar Level Transmitter

DESCRIPTION

The Enhanced Eclipse® Model 705 Transmitter is a loop-powered, 24 VDC liquid-level transmitter based on the revolutionary Guided Wave Radar (GWR) technology. Encompassing a number of significant engineering accomplishments, this leading-edge level transmitter is designed to provide measurement performance well beyond that of many traditional technologies, as well as “through-air” radar.

The innovative enclosure is a first in the industry, orienting dual compartments (wiring and electronics) in the same plane, and angled to maximize ease of wiring, configuration, and data display.

One universal transmitter can be used with all probe types and offers enhanced reliability for use in SIL 2/SIL 3 hardware systems.

ECLIPSE supports the FDT/DTM standard and, with the PACTware™ Frame Program, allows for additional configuration and trending flexibility.

FEATURES

- “TRUE LEVEL” measurement—not affected by media characteristics (e.g., dielectrics, pressure, density, pH, viscosity, etc.)
- Two-wire, 24 VDC loop-powered transmitter for level, interface, or volume.
- 20-point custom strapping table for volumetric output.
- 360° rotatable housing can be dismantled without depressurizing the vessel.
- Two-line, 8-character LCD and 3-button keypad.
- Probe designs: up to +800 °F / 6250 psi (+430 °C / 430 bar).
- Saturated steam applications up to 2250 psi @ +650 °F (155 bar @ +345 °C).
- Cryogenic applications down to -320 °F (-196 °C).
- Integral or remote electronics (up to 12 feet (3.6 m)).
- Certified for use in SIL 2/SIL 3 Loops (full FMEDA report available).

Measures Level, Volume, and Interface



APPLICATIONS

MEDIA: Liquids or slurries; hydrocarbons to water-based media (dielectric 1.4 - 100).

VESSELS: Most process or storage vessels up to rated probe temperature and pressure.

CONDITIONS: All level measurement and control applications including process conditions exhibiting visible vapors, foam, surface agitation, bubbling or boiling, high fill/empty rates, low level and varying dielectric media or specific gravity.

Download your free copy of the ECLIPSE 705 performance reports by WIB/Evaluation International (SIREP)/EXERA from magnetrol.com.

OVERALL LEVEL

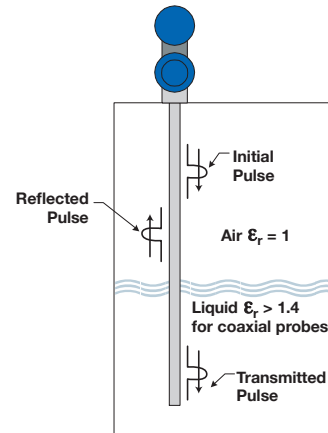
ECLIPSE Guided Wave Radar is based upon the technology of TDR (Time Domain Reflectometry). TDR utilizes pulses of electromagnetic energy transmitted down a wave guide (probe). When a pulse reaches a liquid surface that has a higher dielectric constant than the air (ϵ_r of 1) in which it is traveling, the pulse is reflected. The transit time of the pulse is then measured via ultra speed timing circuitry that provides an accurate measure of the liquid level.

INTERFACE LEVEL

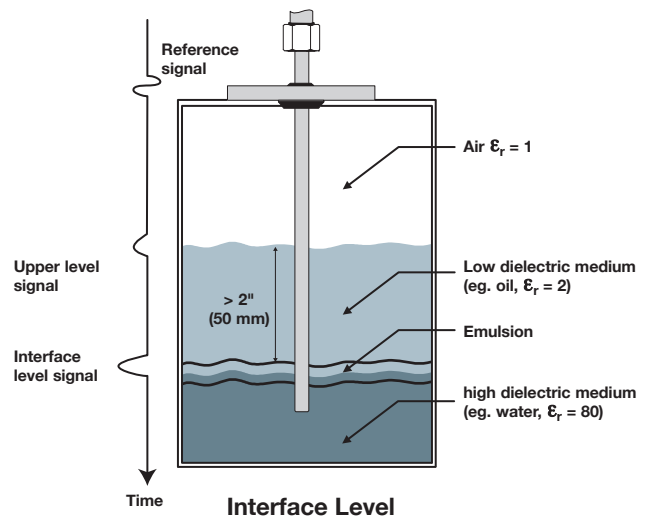
The ECLIPSE Model 705 is capable of measuring both an upper liquid level and an interface liquid level. Even after the pulse is reflected from the upper surface, some of the energy continues down the GWR probe through the upper liquid. The pulse is again reflected when it reaches the higher dielectric lower liquid. It is required that the upper liquid has a dielectric constant between 1.4 and 5, and the lower liquid has a dielectric constant greater than 15. A typical application would be oil over water, with the upper layer of oil being non-conductive ($\epsilon_r \approx 2.0$), and the lower layer of water being very conductive ($\epsilon_r \approx 80$). The thickness of the upper layer must be $> 2"$ (50 mm). The maximum upper layer is limited to the length of the GWR probe, which is available in lengths up to 40 feet (12 meters).

EMULSION LAYERS

As emulsion (rag) layers can decrease the strength of the reflected signal, the ECLIPSE Model 705 is recommended for applications that have clean, distinct layers. The ECLIPSE Model 705 will tend to detect the top of the emulsion layer. Contact the factory for application assistance regarding emulsion layers.



Overall Liquid Level



Interface Level

PROBE OVERVIEW

Choosing the proper Guided Wave Radar (GWR) probe is the most important decision in the application process. The probe configuration establishes fundamental performance characteristics. Coaxial and single rod are the basic configurations used today; both with specific strengths and weaknesses.

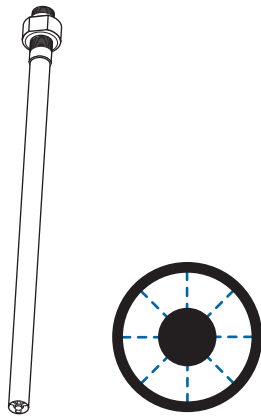


Figure 1
Coaxial Probe

COAXIAL PROBES

The Coaxial probe is the most efficient of all probe configurations and should be the first consideration in all applications. Analogous to the efficiency of modern, coaxial cable, coaxial probes allow almost unimpeded movement of the high frequency pulses throughout its length.

The electromagnetic field that develops between the inner rod and outer tube is completely contained. See Figure 1. The efficiency and sensitivity of a coaxial configuration yields robust signal strength even in extremely low dielectric ($\epsilon_r \geq 1.4$) applications. The sensitivity of this “closed” design, however, also makes it more susceptible to measurement error in applications of coating and buildup.

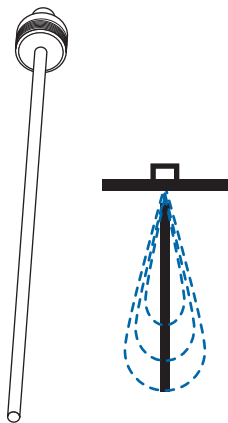


Figure 2
Single Rod Probe

SINGLE ROD PROBES

Single element GWR probes act quite differently from Coaxial and Twin element designs. The pulses of energy develop between the center rod and the mounting nut or flange; the pulse propagates down the rod as it references its ground at the top of the tank. The efficiency of the pulse “launch” is directly related to how much metallic surface exists around it at the top of the vessel.

Figure 2 shows the single element design and how the pulse expands into a teardrop shape as it propagates away from the top of the tank (ground reference). This Single element configuration is the least efficient of the three with minimum dielectric detection approximately $\epsilon_r > 10$. This dielectric performance improves considerably ($\epsilon_r > 1.9$) when the probe is installed between 2–6" (50–150 mm) of a metal tank wall or in a cage/bridle. Because the design is the “open”, it exhibits two strong tendencies. First, it is the most forgiving of coating and buildup. (The PFA-insulated probe is the best choice for severe coating). Secondly, it is most affected by proximity issues. It is important to note that a parallel metal wall INCREASES its performance while a singular, metal object protruding near the probe may be improperly detected as a liquid level.

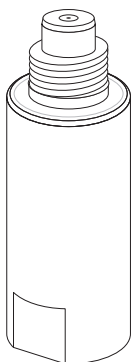


Figure 3
Model 705 Probe Adapter

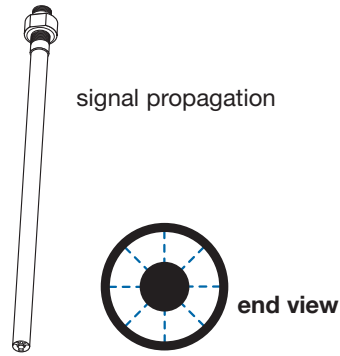
MODEL 705/706 ADAPTER

Refer to product bulletin 57-106. The latest generation Model 706 GWR transmitter is now available with an adapter that will enable operation with legacy Model 705 HART® transmitters and probes.

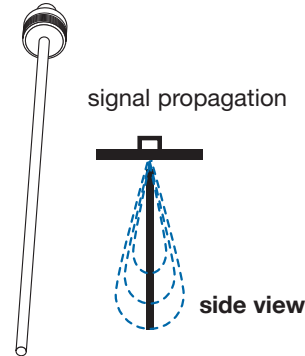
Installed in between the Model 706 transmitter and an existing, installed Model 705 probe, this unique accessory allows one to easily obtain all of the performance advantages, proactive diagnostics, and user-friendly configuration of the powerful Model 706!

SELECTION GUIDE

COAXIAL TYPE GWR PROBE



SINGLE ROD



Application	Dielectric Limit	Temperature Limits	Pressure	Applications			GWR Probe
				Vacuum ①	Overfill Safe	Foam ②	
Coaxial GWR Probes: Maximum Viscosity 500 cP (I.D. 3/4") – 1500 cP (I.D. 1 1/4")							
High Temp./High Pressure Level/Interface	ϵ_r 1.4–100 ③	-321 to 800 °F (-196 to +430 °C)	max 6250 psig (430 bar)	Full	Yes	No	7xD 7xL
Saturated Steam	ϵ_r 10–100	up to +575 °F (up to +300 °C)	max 1275 psig (88 bar)	Yes	No	No	7xS
		up to +650 °F (up to +345 °C)	max 2250 psig (155 bar)				7xQ
Level/Interface	ϵ_r 1.4–100	-40 to +400 °F (-40 to +200 °C)	max 1015 psig (70 bar)	Yes	Yes	No	7xT 7xN
Single Rod GWR Probes: Maximum Viscosity 10,000 cP							
Liquids – Rod ④	ϵ_r 1.9–100	-40 to +300 °F (-40 to +150 °C)	max 1000 psig (70 bar)	Yes	No	Yes	7xF
High Temp./High Pressure ④	ϵ_r 1.9–100	-40 to +600 °F (-40 to +315 °C)	max 3550 psig (245 bar)	Yes	No	Yes	7xJ

① Each ECLIPSE probe can be used for vacuum service (negative pressure) but only the Borosilicate GWR probes (7xD/7xL) are suited for full vacuum conditions (Helium leak < 10⁻³ cc/s @ 1 bar abs.)

② ECLIPSE is ideally suited to be used on foaming applications but in specific conditions where dense foam can enter in the stilling well, coaxial GWR probes are not recommended.

③ Depends on the spacer material. See model selection 7xD/7xL GWR probe.

④ For media with ϵ_r 1.9 to 10, GWR probe must be mounted between 3" and 6" (75 and 150 mm) away from the metal tank wall or in a metal cage/stillwell.

HYGIENIC MODEL 705



ECLIPSE 705 is available with a deep drawn housing and a 0.4 µm (RA 15) finished single rod GWR probe for use in ultra clean environments.

Refer to bulletin 57-110.

3/4" Hygienic Connection without bend

0.25 inch diameter probes suitable for use in smaller vessels where space is at a premium. Available in lengths up to 72 inches.



1 1/2" Hygienic Connection with bend

316 SS probes can be bent to avoid internal obstructions such as agitator blades and spray balls, and to insure lowest possible level detection.



TRANSMITTER SPECIFICATIONS

FUNCTIONAL / PHYSICAL

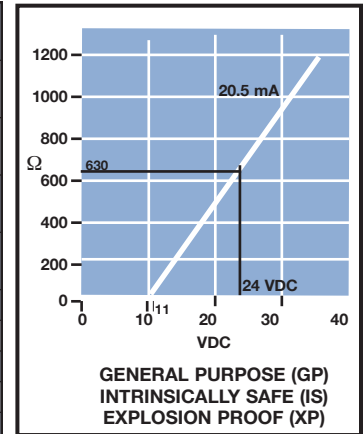
Power (at terminals)	General Purpose / Intrinsically Safe		11 to 28.6 VDC
	Explosion Proof (with Intrinsically Safe probe)		11 to 36 VDC
	FOUNDATION fieldbus™ and PROFIBUS PA™ (FISCO)		9 to 17.5 VDC
	FOUNDATION fieldbus™ and PROFIBUS PA™ (FNICO Exd)		9 to 32 VDC
Signal Output	4–20 mA with HART®	3.8 mA to 20.5 mA useable (meets NAMUR NE 43) — HART 6	
	FOUNDATION fieldbus™	H1 (ITK Ver. 5.01) or Profibus PA™ H1	
	PROFIBUS PA™		
Span			6" to 75' (15 mm to 22 m) except 7xS: max 15' (45 m)
Resolution			Analog: 0.01 mA Display: 0.1 (inches or centimeters)
Loop Resistance			630 Ω @ 20.5 mA - 24 VDC
Damping			Adjustable 0-10 s
Diagnostic Alarm			Adjustable 3.6 mA, 22 mA, HOLD
User Interface			HART® communicator, AMS® or PACTware™, FOUNDATION fieldbus™, PROFIBUS PA™, and/or 3-button keypad
Display			2-line x 8-character LCD
Menu Language			English/Spanish/French/German (FOUNDATION fieldbus™ and PROFIBUS PA: English)
Housing Material			IP 66/Aluminium A356T6 (< 0.20 % copper) 316 stainless steel
SIL ① (Safety Integrity Level)	Standard electronics	Functional safety to SIL 1 as 1oo1 / SIL 2 as 1oo2 in accordance to 61508 – SFF of 85.4 % – full FMEDA reports and declaration sheets available at request	
	Enhanced electronics	Functional safety to SIL 2 as 1oo1 in accordance to 61508 – SFF of 91 % – full FMEDA reports and declaration sheets available at request. Certified for use in SIL 3 Loops.	
Electrical Data			Ui = 28.4 V, li = 94 mA, Pi = 0.67 W Ci = 0.56 V, li = 380 mA, Pi = 5.32 W (FOUNDATION fieldbus™ / PROFIBUS PA)
Equivalent Data			Ci = 2.2 nF, Li = 3 μH Ci = 0.56 nF, Li = 3 μH (FOUNDATION fieldbus™ / PROFIBUS PA)
Shock/Vibration Class			ANSI/ISA-571.03 SA1 (Shock), ANSI/ISA-571.03 VC2 (Vibration)
Net and Gross Weight	Cast aluminium	6 lbs. (2.7 kg) net; 7 lbs. (3.2 kg) gross – transmitter only	
	Stainless steel	12.5 lbs. (5.7 kg) net; 13.5 lbs. (6.2 kg) gross – transmitter only	
Overall Dimensions			H 8.43" (214 mm) x W 4.38" (111 mm) x D 7.40" (188 mm)
FOUNDATION fieldbus™ specifications	ITK Version	5.01	
	H1 Device Class	Link Master (LAS) – selectable ON/OFF	
	H1 Profile Class	31PS, 32L	
	Function Blocks	1 x RB (s), 4 x AI (s), 1 x TB (c), and (1) PID	
	Quiescent current draw	15 mA	
	Execution time	15 ms (40 msec PID Block)	
	CFF files	Downloads available from Host system supplier or www.fieldbus.org	
Profibus PA specifications	Device revision	0x01	
	Digital communication protocol	Version 3.0 MBP (31.25 kbits/sec)	
	Function Blocks	1 x PB, 4 x AI blocks, 1 x TB	
	Quiescent current draw	15 mA	
	Execution time	15 ms	
	GSD files	Downloads available from www.profibus.com or Magnetrol.com	

① Not applicable for FOUNDATION fieldbus™ and PROFIBUS PA™ units.

TRANSMITTER SPECIFICATIONS

PERFORMANCE

Reference Conditions with a 72" coaxial type GWR probe ①		Reflection from liquid, with dielectric in center of selected range, at 70 °F (+20 °C) with CFD threshold
Linearity ②	Coaxial probes	< 0.1 % of probe length or 0.1" (2.5 mm), whichever is greater
	Single lead probes	< 0.3 % of probe length or 0.3" (8 mm), whichever is greater
Accuracy ②③	Coaxial probes	< 0.1 % of probe length or 0.1" (2.5 mm), whichever is greater
	Single lead probes	± 0.5 % of probe length or 0.5" (13 mm), whichever is greater
	7xT/7xL interface	± 1" (25 mm)
Resolution	± 0.1" (2.5 mm)	
Repeatability	< 0.1" (2.5 mm)	
Hysteresis	< 0.1" (2.5 mm)	
Response Time	< 1 second	
Warm-up Time	< 5 seconds	
Ambient Temp.	-40 to +175 °F (-40 to +80 °C): blind transmitter -5 to +160 °F (-20 to +70 °C): with digital display -40 to +160 °F (-40 to +70 °C): for EEx ia and EEx d[ia] with blind transmitter -5 to +160 °F (-20 to +70 °C): for EEx ia and EEx d[ia] with digital display	
Process Dielectric Effect	< 0.3" (7.5 mm) within selected range	
Operating Temp. Effect	Approx. +0.02 % of probe length/°C for probes ≥ 8' (2.5 m)	
Humidity	0-99 %, non-condensing	
Electromagnetic Compatibility	Meets CE requirements (EN-61326: 1997+A1+A2) and NAMUR NE 21 (Single and Twin Rod probe must be used in metallic vessel or stillwell)	
Surge Protection	Meets CE EN61326 (1000 V)	



- ① Specifications will degrade with fixed threshold configuration.
- ② Top 24 inches of Model 7xB probe: 1.2 inches (30 mm).
- ③ Accuracy may degrade when using manual or automatic compensation.

PROBE SPECIFICATIONS

Description		7xD / 7xL: High Pressure / High Temperature GWR Probe	7xQ/7xS: Saturated Steam GWR Probe
Materials	Probe	316/316L (1.4401/1.4404), Hastelloy C® (2.4819) or Monel® (2.4360)	
	Process seal	Borosilicate/Inconel X750	High Temp PEEK with Aegis PF 128 Alumina (7xQ only)
	Spacers	High Temp PEEK (7xD-V, N, P and R) – Alumina (7xD-A, B and C) – TFE (7xD-W)	High Temp PEEK (7xS) Alumina (7xQ)
Probe diameter	Standard coax	Inner rod: 0.31" (8 mm) Outer tube: 7xD, 7xL, 7xS: 0.87" (22.5 mm) 7xQ: 1.25" (31.75 mm)	
	Enlarged coax	Stainless steel: Inner rod 0.63" (16 mm) Outer tube 1.75" (45 mm) Hastelloy C and Monel: Inner rod 0.63" (16 mm) Outer tube 1.92" (49 mm)	n/a
Process Connection		Threaded: ¾" NPT or 1" BSP (G1) – except for enlarged probe (Not available with 7xQ) Flanged: Various ANSI, DIN or “proprietary” mating flanges	
Probe length		From 24 to 240 inches (60 to 610 cm) ①	From 24 to 180 inches (60 to 450 cm)
Transition Zone ②	Top	None	8" (200 mm) ③
	Bottom	ϵ_r : 1.4 = 6" (150 mm) / ϵ_r : 80 = 1" (25 mm)	$\epsilon_r \geq 10 = 1" (25 mm)$
Max. Process Temp.	Max	+800 °F @ 1500 psi (+430 °C @ 103 bar) +650 °F @ 4700 psi (+345 °C @ 324 bar) for 7xx-V, N, P and R +550 °F @ 5700 psi (+288 °C @ 393 bar) for 7xx-W	+575 °F @ 1275 psi (+300 °C @ 88 bar) (7xS) +650 °F @ 2250 psi (+345 °C @ 155 bar) (7xQ)
	Min	-320 °F @ 2000 psi (-196 °C @ 135 bar)	0 °F @ 3000 psi (-15 °C @ 205 bar)
Max. Process Pressure ④		6250 psi @ +70 °F (430 bar @ +20 °C)	1275 psi @ +575 °F (88 bar @ +300 °C) (7xS) 2250 psi @ +650 °F (155 bar @ +345 °C) (7xQ)
Max. Viscosity		500 cP (standard) / 1500 cP (enlarged)	500 cP
Dielectric Range		$\epsilon_r \geq 1.4$ -100: 7xx-W, V, N, P and R $\epsilon_r \geq 2$,0-100: 7xx-A, B and C	10 to 100
Vacuum service		Full vacuum (Helium leak < 10 ⁻⁸ cc/s @ 1 atmosphere vacuum)	Negative pressure but not hermetic seal

Description		7xT / 7xN: Overfill/Interface GWR Probe
Materials	Probe	316/316L (1.4401/1.4404) Hastelloy C® (2.4819) or Monel® (2.4360)
	Process seal	TFE with Viton® GFLT or Kalrez 4079 (Consult factory for alternatives)
	Spacers	Teflon
Probe diameter	Small coax	Inner rod 0.31" (8 mm) Outer tube 0.87" (22.5 mm)
	Large coax	Stainless steel: Inner rod 0.63" (16 mm) – Outer tube 1.75" (45 mm) Hastelloy C and Monel: Inner rod 0.63" (16 mm) – Outer tube 1.92" (49 mm)
Mounting		In-tank mounting / external cage mounting – overfill safe
Process Connection		Threaded: ¾" NPT or 1" BSP (G1) – except for enlarged probe Flanged: Various ANSI, DIN or “proprietary” mating flanges
Probe length		From 24 to 240 inches (60 to 610 cm), selectable in 1-inch or 1-cm increments ①
Transition Zone ②	Top	None
	Bottom	ϵ_r : 1.4 = 6" (150 mm)/ ϵ_r : 80 = 2" (50 mm)
Process Temp.	Max	+400 °F @ 270 psi (+200 °C @ 18 bar)
	Min	-40 °F @ 750 psi (-40 °C @ 50 bar)
Max. Process Pressure ④		1000 psi @ +70 °F (70 bar @ +20 °C)
Max. Viscosity		500 cP
Dielectric Range		Upper liquid: ≥ 1.4 and ≤ 5 , Lower liquid: ≥ 15
Vacuum service		Negative pressure but not hermetic seal
Media coating		In case of media coating, select 7xN probe.

① Consult factory for insertion length < 24" (60 cm).

② Transition Zone (zone with reduced accuracy) is dielectric dependent; ϵ_r = dielectric permittivity. It is recommended to set 4–20 mA signal outside transition zones.

③ Consult factory for overfill applications.

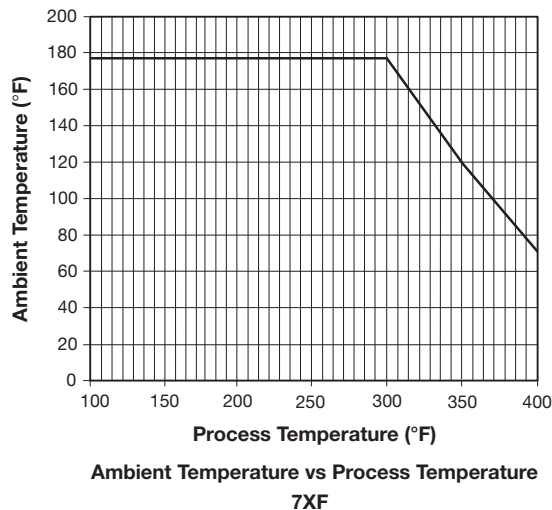
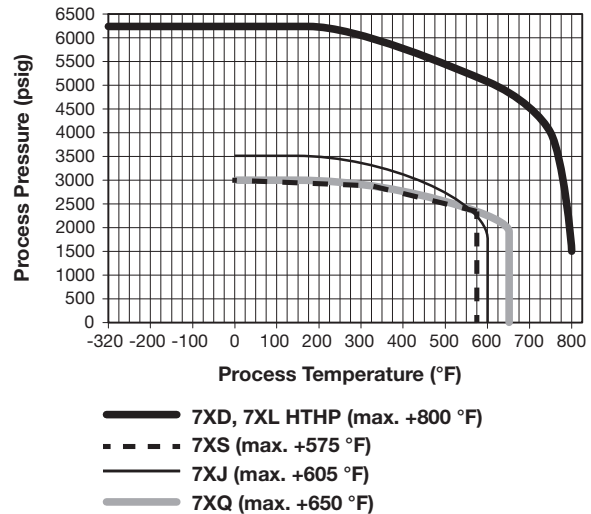
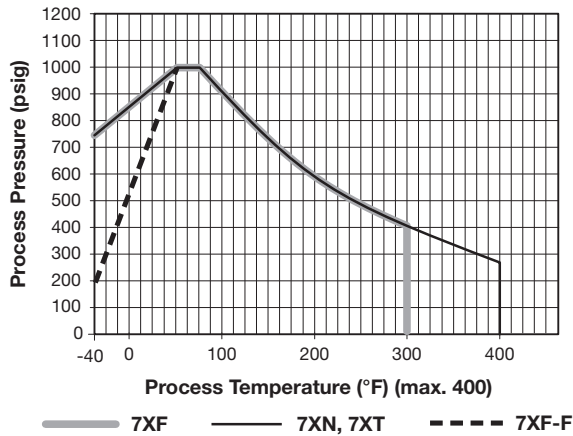
④ See tables on page 8.

PROBE SPECIFICATIONS

Description		7xF: standard single rod	7xJ: HTHP single rod
Materials	Probe	316/316L (1.4401/1.4404), Monel® (2.4360), Hastelloy C® (2.4819) or PFA insulated 316/316L (1.4401/1.4404)	316/316L (1.4401/1.4404), Monel® (2.4360) or Hastelloy C® (2.4819)
	Process seal	TFE with Viton® GFLT or Kalrez 4079 (Consult factory for alternatives)	PEEK with Aegis PF 128
Probe diameter		Bare: 0.50" (13 mm) - PFA coated: 0.625" (16 mm)	Bare: 0.50" (13 mm)
Mounting		See mounting considerations on page 21	
Process Connection		Threaded: 2" NPT or 2" BSP (G2) – Flanged: Various ANSI or EN/DIN	
Probe length		From 24 to 240 inches (60 to 610 cm) selectable in 1-inch or 1-cm increments	
Blocking distance (top)		4.8" up to 36" (12 up to 91 cm) - depending probe length (adjustable)	
Transition Zone ① (bottom)		$\epsilon_r \geq 10$: 1" (25 mm)	
Process Temp.	Max	+300 °F @ 400 psi (+150° C @ 27 bar) ambient	+600 °F @ 2250 psi (+315 °C @ 155 bar)
	Min	-40 °F @ 750 psi (-40 °C @ 50 bar) – 200 psi (13.7 bar)	0° F @ 3550 psi (-15 °C @ 245 bar)
Max Process Pressure		1000 psi @ +70 °F (70 bar @ +20 °C)	3550 psi @ +70 °F (245 bar @ +20 °C)
Max Viscosity		10.000 cP – consult factory in case of agitation/turbulence	
Dielectric Range		ϵ_r 10-100 (depending installation conditions, down to $\epsilon_r \geq 1.9$) – liquids	
Mechanical load		Not applicable	
Pull-down force		Not applicable	
Media coating		Maximum error of 10% of coated length. % Error is related to dielectric of medium, thickness of coating and coated probe length above level.	

① Transition Zone (zone with reduced accuracy) is dielectric dependent; ϵ_r = dielectric permittivity. It is recommended to set 4–20 mA signal outside the transition zone / blocking distance.

TEMPERATURE/PRESSURE RATING FOR ECLIPSE® PROBE SEALS



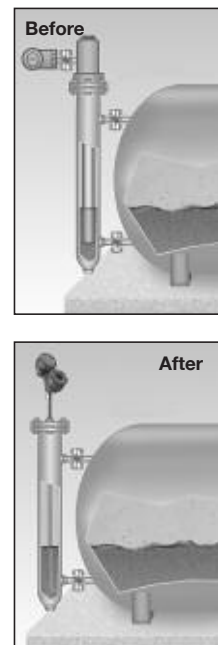
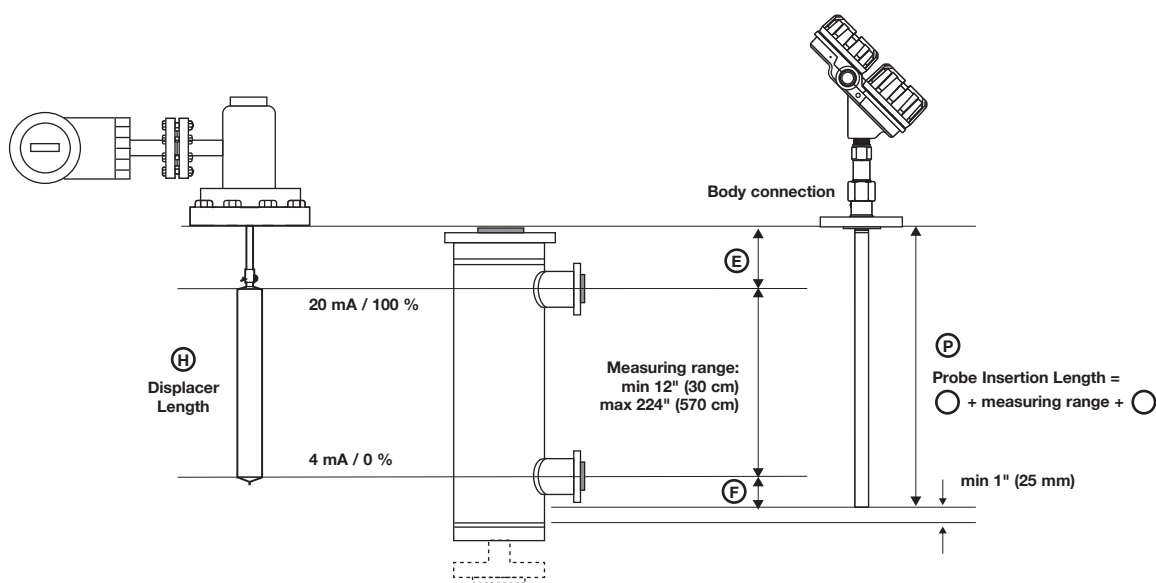
REPLACEMENT OF DISPLACER TRANSMITTER

ECLIPSE has proven to be the ideal replacement for existing torque tube transmitters. In numerous applications around the world, customers have found ECLIPSE Guided Wave Radar superior to torque tube transmitters:

- **Cost:**
A new ECLIPSE costs only slightly more than rebuilding an aging torque tube.
- **Installation:**
No field calibration is necessary; it can be configured in minutes with no level movement. Factory pre-configuration is available.
- **Performance:**
ECLIPSE is not affected by changes in specific gravity or dielectric.
- **Ease of replacement:**
Proprietary flanges are offered so existing chamber/cages can be used.

In order to match the proper ECLIPSE transmitter with the proper external cage, consider the following:

- **Type of application:**
Use the applicable GWR probe, see pages 14 to 22.
- **Overfill proof:**
“Overfill” occurs when the level rises above the maximum range of operation. *Radar based probes may provide erroneous output in this zone unless an optimal design is used.* ECLIPSE GWR overfill probes without top transition zones (e.g., 7xR, 7xD, 7xT) are always safe to use. In cases where the application demands a different probe type, other selections can be considered and the recommended installation precautions should be followed.
- **Min cage size:**
 - Coaxial type: min 2"
 - Enlarged Coaxial Type: min 3"



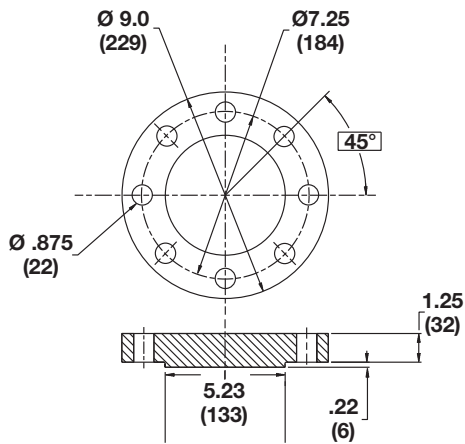
Recommended probe length for replacing displacer transmitters

The table below helps to define the GWR probe length for the most common displacer transmitters. Refer to the flange selection guide on the next page.

Manufacturer	Type	Process connection	Displacer length inches (mm)	Probe length ^① inches (mm)
Magnetrol®	EZ & PN Modulelevel®	ANSI/DIN flange	≥ 14" (356)	Displacer + 7 (178)
Masoneilan®	Series 1200	Proprietary flange	≥ 14" (356)	Displacer + 8 (203)
		ANSI/DIN flange	≥ 16" (406)	Displacer + 8 (203)
Fisher® series 2300 & 2500	249B, 259B, 249C cages	Proprietary flange	≥ 14" (356)	Displacer + 10 (254)
	other cages	ANSI flange	≥ 14" (356)	consult factory
Eckhardt®	Series 134, 144	ANSI/DIN flange	≥ 14" (356)	consult factory
Tokyo Keiso®	FST-3000	ANSI/DIN flange	H = 11.8" (300)	Displacer + 9 (229)
		ANSI/DIN flange	≥ H = 19.7" (500)	Displacer + 9 (229)

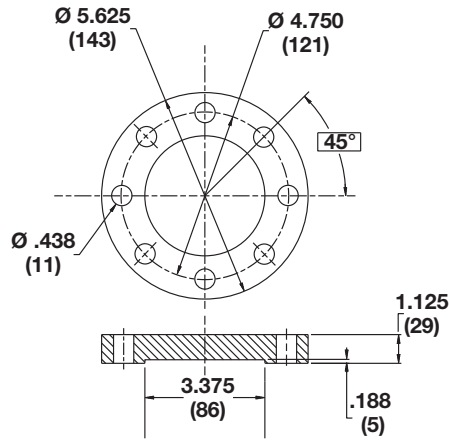
① Round down resulting calculation to the nearest inch.

PROPRIETARY FLANGES



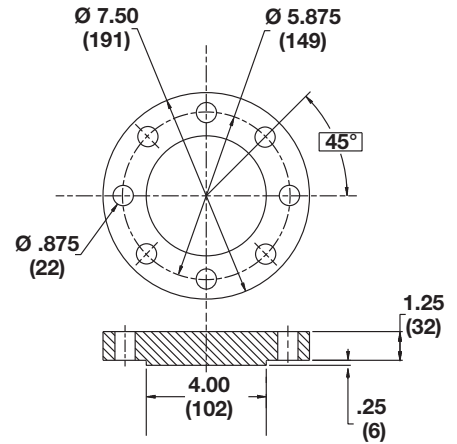
Fisher 249B/259B (600 lb.), carbon steel

Figure 4



Fisher 249C (600 lb.), 316 stainless steel

Figure 5



Masoneilan (600 lb.), carbon steel

Figure 6

CAGES

ECLIPSE can be installed into cages as small as 2". When a new cage is needed, it can be ordered together with the ECLIPSE. Magnetrol has a long tradition in offering cost-effective cages. Magnetrol cages can be manufactured to comply with PED regulations and are available with a wide variety of options.

Measuring span	12-240" (30-610 cm) ①
Materials of construction	Carbon steel or 316 (1.4401) stainless steel
Process connection sizes	¾", 1", 1 ½", 2"
Process connection ratings	150#-2500# ANSI
Configurations	Side-Side and Side-Bottom
Process pressures	Up to 6250 psig (430 bar) ①
Process temperatures	Up to +800 °F (+430 °C) ①

① Limitations are defined per selected GWR probe.

For more details – refer to bulletin 41-140.



AURORA®



The Orion Instruments® Aurora® is the innovative combination of the ECLIPSE Guided Wave Radar transmitter and a Magnetic Level Indicator (MLI). The integration of these two independent technologies provides excellent redundancy. The float positioned within the AURORA 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 ECLIPSE transmitter continuously emits electromagnetic radar pulses directly off the liquid surface, and provides a real-time level output, in addition to the external visual indicator operated by the AURORA internal float.

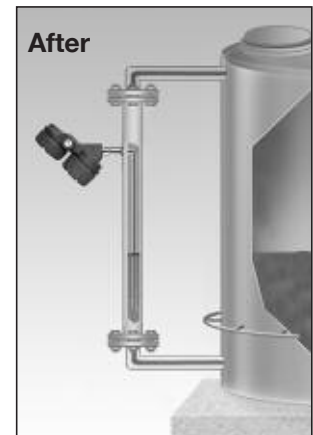


For more details, refer to bulletin ORI-101.

REPLACEMENT OF TOP/BOTTOM CAGES

In addition to the Magnetrol® Torque Tube Cage Flange options, the ECLIPSE 705 transmitter and 7EK GWR probe/cage can also be used in replacing existing Top/Bottom and Top/Side torque tube installations.

After removal of the existing torque tube cage assembly (controller, displacer and cage), ECLIPSE Guided Wave Radar may then be installed directly in its place. Several models are available for some of the major torque tube displacer transmitter manufacturers. Because the Model 7EK probe/cage mounting dimensions and measuring ranges match the original manufacturer’s specification, no re-piping is necessary.





These units are in compliance with the EMC-directive 2014/30/EU, the PED-directive 2014/68/EU and the ATEX directive 2014/34/EU.

Explosion Proof (with intrinsically Safe Probe)

US/Canada: FM19US0091X/FM19CA0047X:

Integral and Remote:

Class I, Div 1, Groups B, C, D T4

Class II, III, Div. 1 Groups E, F, G T4

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

Type 4X, IP66

Integral:

US: Class I, Zone 0,1 AEx ia/db IIC T4 Ga/Gb

Canada: Ex ia/db IIC T4 Ga/Gb

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

Type 4X, IP66

Remote:

US: Class I, Zone 1 AEx db [ia Ga] IIC T4 Gb

Canada: Ex db [ia Ga] IIC T4 Gb

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

Type 4X, IP66

Flame Proof

ATEX – FM19ATEX0175X:

Integral:

II 1/2 G Ex ia/db IIC T4 Ga/Gb

Remote:

II 2(1) G Ex db [ia Ga] IIC T4 Gb

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

IEC IECEx FMG19.0022X:

Integral:

Ex ia/db IIC T4 Ga/Gb

Remote:

Ex db [ia Ga] IIC T4 Gb

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

Intrinsically Safe

US/Canada: FM19US0091X/FM19CA0047X:

Integral and Remote:

Class I, II, III, Div. 1 Group A, B, C, D, E, F, G T4

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

Type 4X, IP66

Integral:

US: Class I, Zone 0 AEx ia IIC T4 Ga

Canada: Ex ia IIC T4 Ga

US: Class I Zone 2 AEx ia IIC T4 Gc

Canada: Ex ic IIC T4 Gc

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

Type 4X, IP66

Remote:

US: Class I, Zone 2 AEx ic [ia Ga] IIC T4 Gc

Canada: Ex ic [ia Ga] IIC T4 Gc

$\text{Ta} = -40^{\circ}\text{C} \text{ to } +70^{\circ}\text{C}$

Type 4X, IP66

ATEX – FM19ATEX0175X:

Integral:

II 1 G Ex ia IIC T4 Ga

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

Remote:

II 3(1) G ic [ia Ga] IIC T4 Gc

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

ATEX – FM20ATEX0013X:

Integral:

II 3 G Ex ic IIC T4 Gc

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

IEC - IECEx FMG19.0022X:

Integral:

Ex ia IIC T4 Ga

Ex ic IIC T4 GC

$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

Remote:

Ex ic [ia Ga] IIC T4 Gc

$\text{Ta} = -40^{\circ}\text{C} \text{ to } +70^{\circ}\text{C}$

IP66

Non-Incendive

US/Canada: FM19US0091X/FM19CA0047X:

Integral and Remote:

US: Class I Div. 2, Groups A, B, C D T4

Class II, III, Div. 2 Groups E, F, and G T4

Canada: Class I Div. 2, Groups A, B, C, D T4

Nonincendive - Class II, III Div. 2, Groups F and G T4


$-40^{\circ}\text{C} \leq \text{Ta} \leq +70^{\circ}\text{C}$

IP66

AVERTISSEMENT! Danger d'explosion éventuel. Ne brancher ou débrancher des équipements que si l'alimentation électrique a été coupée ou si la zone est réputée non dangereuse.

MODEL NUMBER

TRANSMITTER

 Models available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

BASIC MODEL NUMBER

705	ECLIPSE Guided Wave Radar Level Transmitter
-----	---

POWER

5	24 VDC, Two-wire
---	------------------

SIGNAL OUTPUT AND ELECTRONICS

1 0	4–20 mA with HART – SIL 1 standard electronics (SFF of 85.4%)
1 A	4–20 mA with HART – SIL 2 certified electronics (SFF of 91%) ①
2 0	FOUNDATION fieldbus™ communication
3 0	PROFIBUS PA™ communication

ACCESSORIES

0	No digital display and keypad
A	Digital display and keypad

MOUNTING/CLASSIFICATION

1	Integral, General Purpose & Intrinsically Safe (FM & CSA), Non-incendive (Class I, Div. 2)
2	Remote, General Purpose & Intrinsically Safe (FM & CSA), Non-incendive (Class I, Div. 2)
3	Integral, Explosion Proof (FM & CSA) & Non-incendive
4	Remote, Explosion Proof (FM & CSA) & Non-incendive
A	Integral, General Purpose & Intrinsically Safe (ATEX & JIS EEx ia IIC T4)
B	Remote, General Purpose & Intrinsically Safe (ATEX & JIS EEx ia IIC T4)
C	Integral, Explosion Proof (ATEX EEx d [ia] IIC T6) (must be ordered with Conduit Connection Codes 0 and 1)
D	Remote, Explosion Proof (ATEX EEx d [ia] IIC T6) (must be ordered with Conduit Connection Codes 0 and 1)
E	Integral, Non-incendive (ATEX EEx n II T4..6)
F	Remote, Non-incendive (ATEX EEx n II T4..6)

HOUSING

1	Cast aluminum, dual compartment, 45° angle
2	316 stainless steel, dual compartment, 45° angle ②
7	Cast aluminum, dual compartment, 45° angle, 12-ft remote
8	316 stainless steel, dual compartment, 45° angle, 12-ft remote ②

CONDUIT CONNECTION

0	¾" NPT
1	M20

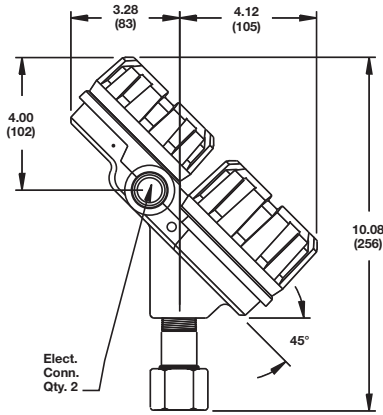
① Not available with Model 7xQ steam probe.

② To reduce the possibility of probe damage due to vibration, it is recommended to use a remote mount transmitter (Mounting/Classification codes 2, 4, B, D or F) when ordering the heavier 316 SS version.

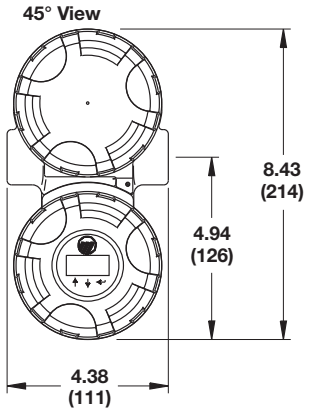


DIMENSIONS

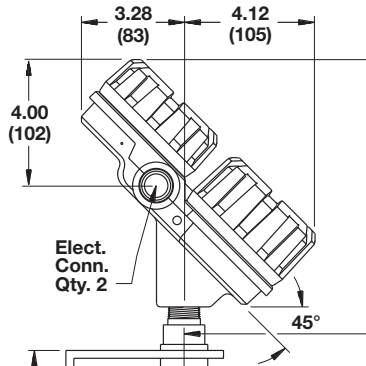
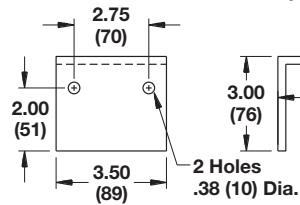
inches (mm)



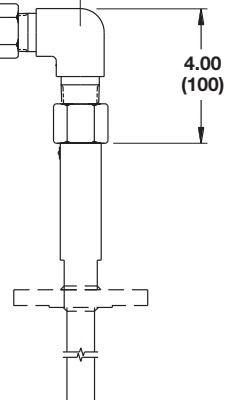
Integral Electronics



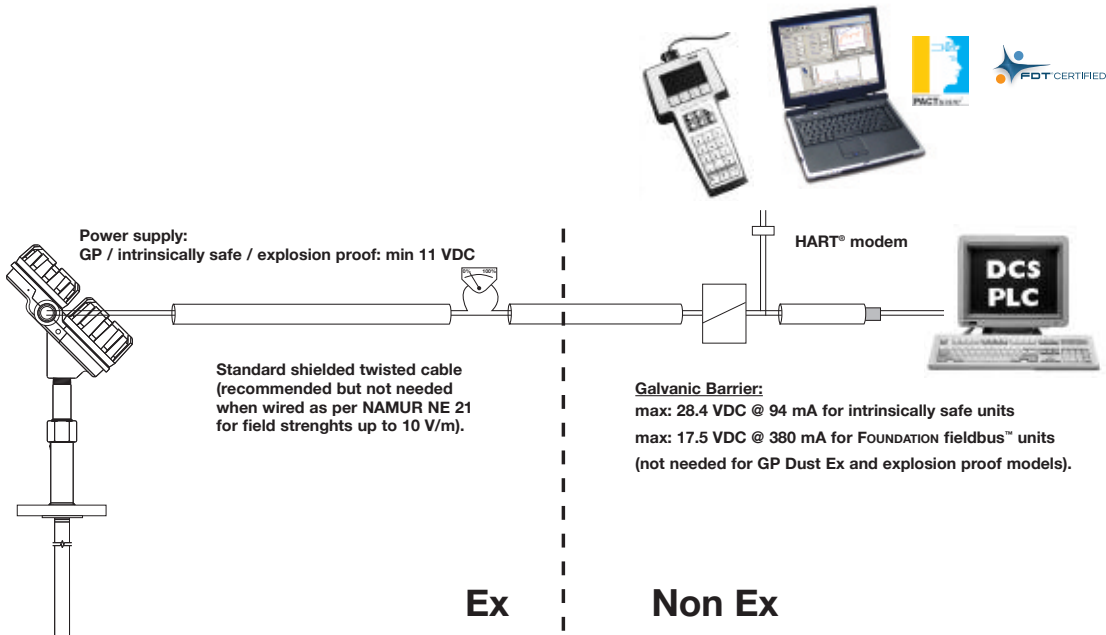
Eclipse® Housing (45° View)



Eclipse® Remote Configurations



ELECTRICAL WIRING



MODEL NUMBER

COAXIAL PROBE

Models available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

BASIC MODEL NUMBER – GWR probe suited for external cage and/or in-tank mounting

7 * T	GWR probe for overall level or interface level	upper liq: $\epsilon_r \geq 1.4$ and ≤ 5 / lower liq: ≥ 15 - WHG aprvd.
7 * N	GWR probe for interface level w/ flushing connection	upper liq: $\epsilon_r \geq 1.4$ and ≤ 5 / lower liq: ≥ 15 - WHG aprvd.

*Specify "E" for English (e.g., 7ET) or "M" for Metric (e.g., 7MT)

MATERIAL OF CONSTRUCTION – wetted parts (including process connection flange when applicable)

A	316/316L (1.4401/1.4404) SS w/ Teflon® spacers
B	Hastelloy C (2.4819)
C	Monel (2.4360)
J	316/316L SS NACE Construction

PROCESS CONNECTION – SIZE/TYPE (consult factory for other process connections)

Refer to Bulletin 57-102 for Enlarged Coaxial Probe

Threaded

1 1	3/8" NPT Thread	2 2	1" BSP (G1) thread
-----	-----------------	-----	--------------------

ANSI Flanges

2 3	1" 150# ANSI RF	4 5	2" 600 lbs. ANSI RF
2 4	1" 300# ANSI RF	5 3	3" 150 lbs. ANSI RF
2 5	1" 600# ANSI RF	5 4	3" 300 lbs. ANSI RF
3 3	1½" 150# ANSI RF	5 5	3" 600 lbs. ANSI RF
3 4	1½" 300# ANSI RF	6 3	4" 150 lbs. ANSI RF
3 5	1½" 600# ANSI RF	6 4	4" 300 lbs. ANSI RF
4 3	2" 150# ANSI RF	6 5	4" 600 lbs. ANSI RF
4 4	2" 300# ANSI RF		

EN/DIN Flanges

B B	DN 25, PN 16/25/40	EN 1092-1 Type A	E A	DN 80, PN 16	EN 1092-1 Type A
B C	DN 25, PN 63/100	EN 1092-1 Type B2	E B	DN 80, PN 25/40	EN 1092-1 Type A
C B	DN 40, PN 16/25/40	EN 1092-1 Type A	E D	DN 80, PN 63	EN 1092-1 Type B2
C C	DN 40, PN 63/100	EN 1092-1 Type B2	E E	DN 80, PN 100	EN 1092-1 Type B2
D A	DN 50, PN 16	EN 1092-1 Type A	F A	DN 100, PN 16	EN 1092-1 Type A
D B	DN 50, PN 25/40	EN 1092-1 Type A	F B	DN 100, PN 25/40	EN 1092-1 Type A
D D	DN 50, PN 63	EN 1092-1 Type B2	F D	DN 100, PN 63	EN 1092-1 Type B2
D E	DN 50, PN 100	EN 1092-1 Type B2	F E	DN 100, PN 100	EN 1092-1 Type B2

Torque Tube Mating Flanges ①

T T	600# Fisher (249B/259B) in carbon steel –	as per dimensions of Figure 4 on page 10
T U	600# Fisher (249C) in stainless steel –	as per dimensions of Figure 5 on page 10
U T	600# Masoneilan flange in carbon steel –	as per dimensions of Figure 6 on page 10
U U	600# Masoneilan flange in stainless steel –	as per dimensions of Figure 6 on page 10

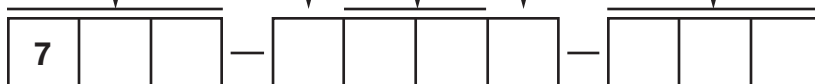
PROCESS SEAL – O-RING MATERIAL ②

0	Viton GFLT seal – for universal use	-40 °F (-40 °C) / +400° F (+200 °C)
2	Kalrez 4079 seal – for aggressive media ③	-40 °F (-40 °C) / +400° F (+200 °C)
8	Aegis PF 128 seal – for steam ④ and NACE apps	-4 °F (-20 °C) / +400° F (+200 °C)

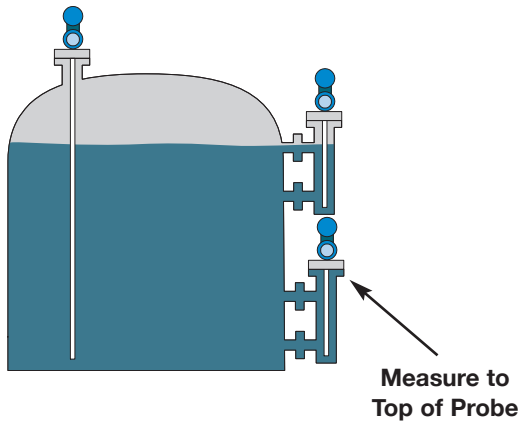
INSERTION LENGTH ⑤

24 to 240 inches (60 to 610 cm)	
(unit of measure is determined by second digit of Model Number)	
Examples: 24 inches = 024; 60 centimeters = 060	

- ① Always check dimensions if ANSI/DIN flanges are not used.
- ② Consult factory for alternative o-ring materials.
- ③ For ammonia/chlorine applications use the 7xD GWR probe. Consult factory for HF acid applications.
- ④ Max +400 °F (+200 °C) for use on steam.
- ⑤ Consult factory for insertion lengths < 24" (60 cm)



COAXIAL PROBE MOUNTING



OVERFILL SAFE & OVERFILL PROOF

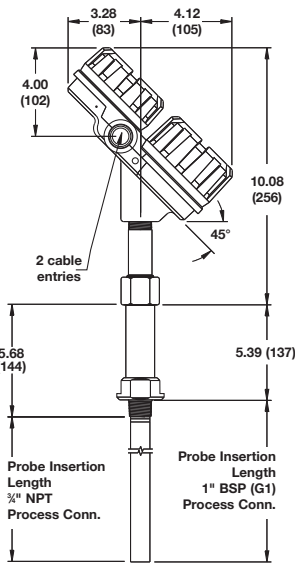
ECLIPSE 7xR, 7xM, 7xT and 7xN coaxial type GWR probes are “overflow safe” in operation and “Overflow proof” certified.

Overflow safe means that the unit is capable of measuring up to the process connection. “Non overflow safe” probes often use software algorithms to ignore level readings in the blocking distance or transition zone. When level rises in this zone, non-overflow safe may consider the end of probe reflection as to the real level and may report an empty vessel instead of a full vessel.

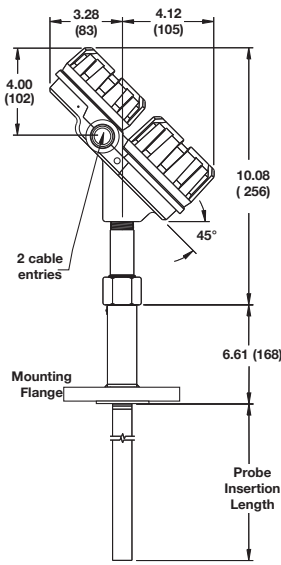
Overflow proof protection (such as WHG or VLAREM) certifies reliable operation when the transmitter is used as overflow alarm but assumes that the installation is designed in such way that the vessel/ cage cannot overflow.

COAXIAL PROBE DIMENSIONS

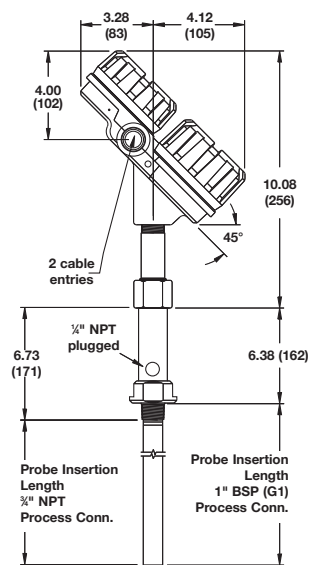
INCHES (mm)



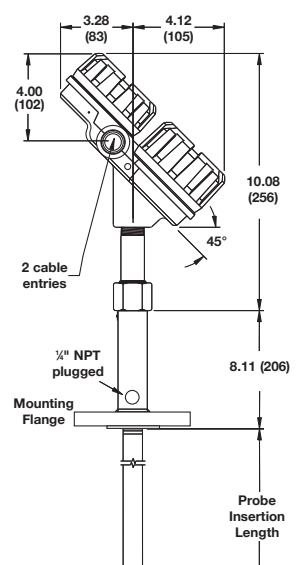
7xT
with threaded connection



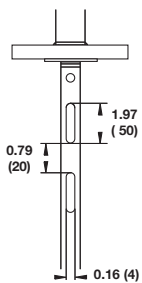
7xT
with flanged connection



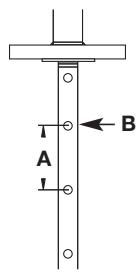
7xN
with flushing connection



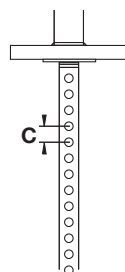
7xN
with flushing connection



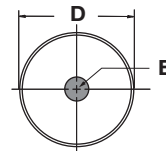
Slots for 7xR-A
(order with
“x” description)



Venting holes
for level



Venting holes
for interface



Coaxial GWR Probe,
End View

Dim.	Standard	Enlarged
A	12 (305)	12 (305)
B	Ø 0.25 (6.4)	Ø 0.5 (12.7)
C	0.75 (19)	1 (25.4)
D	0.88 (22.5)	1.75 (45) - SST 1.92 (49) - HC and Monel
E	0.31 (8)	0.63 (16)

MODEL NUMBER

HIGH TEMP/PRESSURE COAXIAL PROBE

Models available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

BASIC MODEL NUMBER – High Temperature/High Pressure Coaxial GWR probe

7 * D	HTHP GWR probe for level	$\epsilon_r \geq 1.4$ - WHG approved ①
7 * L	HTHP GWR probe for level with flushing connection	$\epsilon_r \geq 1.4$ - WHG approved ①

*Specify "E" for English (e.g., 7ED) or "M" for Metric (e.g., 7MD)

MATERIAL OF CONSTRUCTION (all wetted parts) and MINIMUM DIELECTRICS

For standard coaxial 7xD/7xL GWR probe - max 6250 psig (430 bar)

A	316/316L (1.4401/1.4404) SST with ceramic spacers	min. $\epsilon_r: \geq 2.0$ /max +800°F (+427°C)
B	Hastelloy C (2.4819) with ceramic spacers	min. $\epsilon_r: \geq 2.0$ /max +800°F (+427°C)
C	Monel (2.4360) with ceramic spacers	min. $\epsilon_r: \geq 2.0$ /max +800°F (+427°C)
J	316/316L SS NACE construction with ceramic spacers	min. $\epsilon_r: \geq 2.0$ /max +800°F (+427°C)
V	316/316L (1.4401/1.4404) SST with H. Temp PEEK® spacers	min. $\epsilon_r: \geq 1.4$ /max +650°F (+345°C)
W	316/316L (1.4401/1.4404) stainless steel with Teflon® spacers	min. $\epsilon_r: \geq 1.4$ /max +550°F (+288°C)

PROCESS CONNECTION – SIZE/TYPE (consult factory for other process connections)

Refer to Bulletin 57-102 for Enlarged Coaxial Probe

Threaded

1 1	3/4" NPT Thread	2 2	1" BSP (G1) thread
-----	-----------------	-----	--------------------

ANSI Flanges

2 3	1" 150# ANSI RF	4 N	2" 2500# ANSI RJ
2 4	1" 300# ANSI RF	5 3	3" 150# ANSI RF
2 5	1" 600# ANSI RF	5 4	3" 300# ANSI RF
2 K	1" 600# ANSI RJ	5 5	3" 600# ANSI RF
2 L	1" 900# ANSI RJ	5 K	3" 600# ANSI RJ
3 3	1 1/2" 150# ANSI RF	5 L	3" 900# ANSI RJ
3 4	1 1/2" 300# ANSI RF	5 M	3" 1500# ANSI RJ
3 5	1 1/2" 600# ANSI RF	5 N	3" 2500# ANSI RJ
3 K	1 1/2" 600# ANSI RJ	6 3	4" 150# ANSI RF
3 M	1 1/2" 900/1500# ANSI RJ	6 4	4" 300# ANSI RF
3 N	1 1/2" 2500# ANSI RJ	6 5	4" 600# ANSI RF
4 3	2" 150# ANSI RF	6 K	4" 600# ANSI RJ
4 4	2" 300# ANSI RF	6 L	4" 900# ANSI RJ
4 5	2" 600# ANSI RF	6 M	4" 1500# ANSI RJ
4 K	2" 600# ANSI RJ	6 N	4" 2500# ANSI RJ
4 M	2" 900/1500# ANSI RJ		

EN/DIN & Torque Tube Mating Flanges (next page)

PROCESS SEAL MATERIAL (next page)

INSERTION LENGTH (next page)



MODEL NUMBER

HIGH TEMP/PRESSURE COAXIAL PROBE (cont.)

EN/DIN Flanges

B B	DN 25, PN 16/25/40	EN 1092-1 Type A
B C	DN 25, PN 63/100	EN 1092-1 Type B2
B F	DN 25, PN 160	EN 1092-1 Type B2
C B	DN 40, PN 16/25/40	EN 1092-1 Type A
C C	DN 40, PN 63/100	EN 1092-1 Type B2
C F	DN 40, PN 160	EN 1092-1 Type B2
C G	DN 40, PN 250	EN 1092-1 Type B2
C H	DN 40, PN 320	EN 1092-1 Type B2
C J	DN 40, PN 400	EN 1092-1 Type B2
D A	DN 50, PN 16	EN 1092-1 Type A
D B	DN 50, PN 25/40	EN 1092-1 Type A
D D	DN 50, PN 63	EN 1092-1 Type B2
D E	DN 50, PN 100	EN 1092-1 Type B2
D F	DN 50, PN 160	EN 1092-1 Type B2
D G	DN 50, PN 250	EN 1092-1 Type B2
D H	DN 50, PN 320	EN 1092-1 Type B2
D J	DN 50, PN 400	EN 1092-1 Type B2

E A	DN 80, PN 16	EN 1092-1 Type A
E B	DN 80, PN 25/40	EN 1092-1 Type A
E D	DN 80, PN 63	EN 1092-1 Type B2
E E	DN 80, PN 100	EN 1092-1 Type B2
E F	DN 80, PN 160	EN 1092-1 Type B2
E G	DN 80, PN 250	EN 1092-1 Type B2
E H	DN 80, PN 320	EN 1092-1 Type B2
E J	DN 80, PN 400	EN 1092-1 Type B2
F A	DN 100, PN 16	EN 1092-1 Type A
F B	DN 100, PN 25/40	EN 1092-1 Type A
F D	DN 100, PN 63	EN 1092-1 Type B2
F E	DN 100, PN 100	EN 1092-1 Type B2
F F	DN 100, PN 160	EN 1092-1 Type B2
F G	DN 100, PN 250	EN 1092-1 Type B2
F H	DN 100, PN 320	EN 1092-1 Type B2
F J	DN 100, PN 400	EN 1092-1 Type B2

Torque Tube Mating Flanges ②

T T	600# Fisher (249B/259B) in carbon steel ③
T U	600# Fisher (249C) in stainless steel ③

U T	600# Masoneilan flange in carbon steel ③
U U	600# Masoneilan flange in stainless steel ③

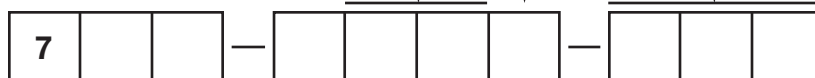
PROCESS SEAL – O-RING MATERIAL

N	Borosilicate seal – for non steam applications (7xD) -320° F (-196° C) / +800° F (+427° C) ④
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INSERTION LENGTH ⑤

24 to 240 inches (60 to 610 cm) (unit of measure is determined by second digit of Model Number) Examples: 24 inches = 024; 60 centimeters = 060

- ① For HTHP interface applications, specify "X7xD": X = 7xD for interface use with multiple venting holes.
- ② Always check dimensions if ANSI/ EN/DIN flanges are not used.
- ③ As per dimensions on page 10.
- ④ 7xD-W: max +400° F (+200° C) – 7xD-V: max +650 °F (+345° C)
- ⑤ For 7xD/7xL, consult factory for insertion lengths < 24" (60 cm)



MODEL NUMBER

STEAM COAXIAL PROBE

Models available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

BASIC MODEL NUMBER – Suited for saturated steam applications

7 * S	Coaxial GWR probe for saturated steam applications, including steam compensation/reference target: +575°F (+300°C) max.
7 * Q	Coaxial GWR probe for saturated steam applications, including steam compensation/reference target: +650°F (+345°C) max.

*Specify "E" for English (e.g., 7EQ or 7ES) or "M" for Metric (e.g., 7MQ or 7MS)

MATERIAL OF CONSTRUCTION (all wetted parts) and MINIMUM DIELECTRICS

A	316/316L (1.4401/1.4404)
K	316/316L (1.4401/1.4404) ASME B31.1 Specifications

PROCESS CONNECTION – SIZE/TYPE (consult factory for other process connections) Flanges are of solid material per selected material of construction

Threaded ①

1 1	¾" NPT Thread
2 2	1" BSP (G1) Thread

ANSI Flanges

2 3	1"	150# ANSI RF
2 4	1"	300# ANSI RF
2 5	1"	600# ANSI RF
2 7	1"	900/1500# ANSI RF
2 K	1"	600# ANSI RJ
2 L	1"	900# ANSI RJ
3 3	1½"	150# ANSI RF
3 4	1½"	300# ANSI RF
3 5	1½"	600# ANSI RF
3 7	1½"	900/1500# ANSI RF
3 K	1½"	600# ANSI RJ
3 M	1½"	900/1500# ANSI RJ
3 N	1½"	2500# ANSI RJ
4 3	2"	150# ANSI RF
4 4	2"	300# ANSI RF
4 5	2"	600# ANSI RF
4 7	2"	900/1500# ANSI RF
4 K	2"	600# ANSI RJ
4 M	2"	900/1500# ANSI RJ
4 N	2"	2500# ANSI RJ
5 3	3"	150# ANSI RF
5 4	3"	300# ANSI RF
5 5	3"	600# ANSI RF
5 6	3"	900# ANSI RF
5 7	3"	1500# ANSI RF
5 K	3"	600# ANSI RJ
5 L	3"	900# ANSI RJ
5 M	3"	1500# ANSI RJ
5 N	3"	2500# ANSI RJ
6 3	4"	150# ANSI RF
6 4	4"	300# ANSI RF
6 5	4"	600# ANSI RF
6 6	4"	900# ANSI RF
6 7	4"	1500# ANSI RF
6 K	4"	600# ANSI RJ
6 L	4"	900# ANSI RJ
6 M	4"	1500# ANSI RJ
6 N	4"	2500# ANSI RJ

EN/DIN Flanges

B B	DN 25, PN 16/25/40 EN 1092-1 Type A
B C	DN 25, PN 63/100 EN 1092-1 Type B2
B F	DN 25, PN 160 EN 1092-1 Type B2
C B	DN 40, PN 16/25/40 EN 1092-1 Type A
C C	DN 40, PN 63/100 EN 1092-1 Type B2
C F	DN 40, PN 160 EN 1092-1 Type B2
C G	DN 40, PN 250 EN 1092-1 Type B2
C H	DN 40, PN 320 EN 1092-1 Type B2
C J	DN 40, PN 400 EN 1092-1 Type B2
D A	DN 50, PN 16 EN 1092-1 Type A
D B	DN 50, PN 25/40 EN 1092-1 Type A
D D	DN 50, PN 63 EN 1092-1 Type B2
D E	DN 50, PN 100 EN 1092-1 Type B2
D F	DN 50, PN 160 EN 1092-1 Type B2
D G	DN 50, PN 250 EN 1092-1 Type B2
D H	DN 50, PN 320 EN 1092-1 Type B2
D J	DN 50, PN 400 EN 1092-1 Type B2
E A	DN 80, PN 16 EN 1092-1 Type A
E B	DN 80, PN 25/40 EN 1092-1 Type A
E D	DN 80, PN 63 EN 1092-1 Type B2
E E	DN 80, PN 100 EN 1092-1 Type B2
E F	DN 80, PN 160 EN 1092-1 Type B2
E G	DN 80, PN 250 EN 1092-1 Type B2
E H	DN 80, PN 320 EN 1092-1 Type B2
E J	DN 80, PN 400 EN 1092-1 Type B2
F A	DN 100, PN 16 EN 1092-1 Type A
F B	DN 100, PN 25/40 EN 1092-1 Type A
F D	DN 100, PN 63 EN 1092-1 Type B2
F E	DN 100, PN 100 EN 1092-1 Type B2
F F	DN 100, PN 160 EN 1092-1 Type B2
F G	DN 100, PN 250 EN 1092-1 Type B2
F H	DN 100, PN 320 EN 1092-1 Type B2
F J	DN 100, PN 400 EN 1092-1 Type B2

Proprietary Flanges ②

T T	600# Fisher (249B/259B) in carbon steel ③
T U	600# Fisher (249C) in stainless steel ③
U T	600# Masoneilan flange in carbon steel ③
U U	600# Masoneilan flange in stainless steel ③

PROCESS SEAL – O-RING MATERIAL

8	Steam Seal (Aegis PF 128 / PEEK)
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INSERTION LENGTH ④

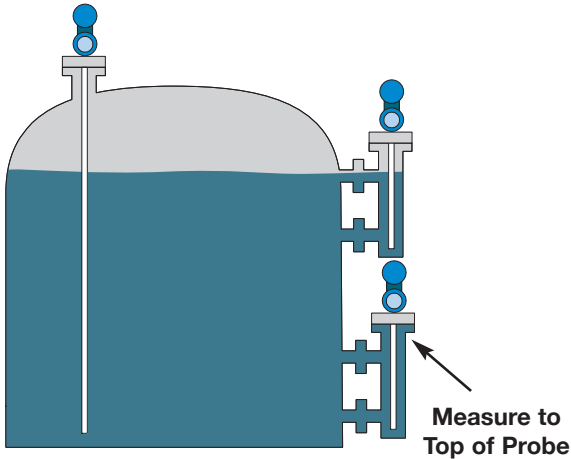
24 to 180 inches (60 to 457 cm) (unit of measure is determined by second digit of Model Number)	
Examples: 24 inches = 024; 60 centimeters = 060	



- ① Not available with 7xQ probe.
- ② Always check dimensions if ANSI/DIN flanges are not used.
- ③ As per dimensions on page 10.
- ④ Consult factory for insertion lengths < 24" (60 cm).

HIGH TEMP / PRESSURE COAXIAL PROBE

INCHES (mm)

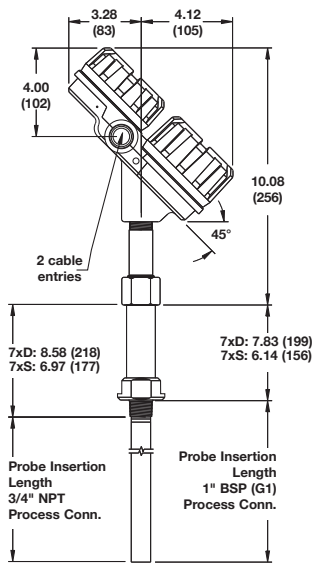


OVERFILL SAFE & OVERFILL PROTECTION

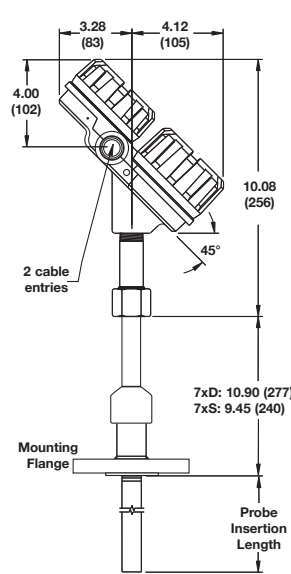
ECLIPSE 7xD and 7xL coaxial type GWR probes are “Overfill safe” in use and “Overfill proof” certified.

Overfill safe means that the unit is capable of measuring up to the process connection. “Non-overfill safe” probes use software to ignore level readings in the blocking distance or transition zone. When level rises in this zone, non-overfill safe probes may consider the end of probe reflection as to the real level and may report an empty vessel instead of an overflowing vessel.

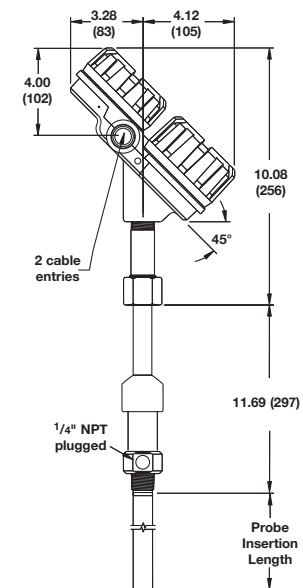
Overfill proof protection (such as WHG or VLAREM) certifies reliable operation when the transmitter is used as overfill alarm but assumes that the installation is designed in such way that the vessel/ cage cannot overflow.



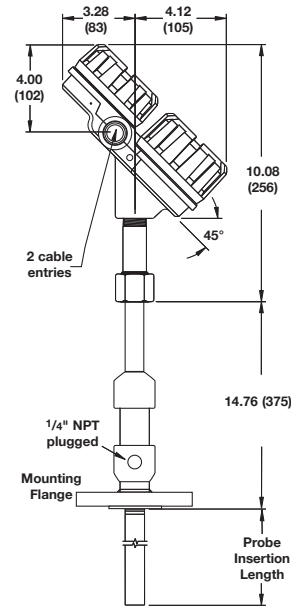
7xD/7xS with threaded connection



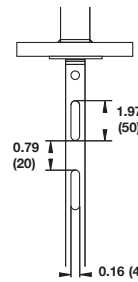
7xD/7xS with flanged connection



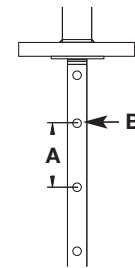
7xL with threaded connection



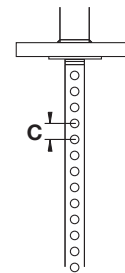
7xL with flanged connection



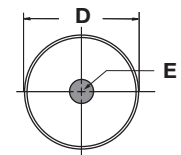
Slots for 7xD - A/V/W (order per "x" description)



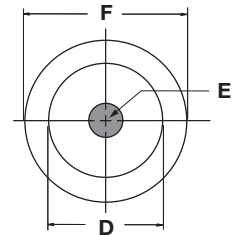
Venting holes for all



Venting holes for 7xD/7xL (order per "x" description)



Coaxial GWR Probe, End View




7xQ End View

Dim.	Standard Coaxial	Enlarged Coaxial
A	12.00 (305)	12.00 (305)
B	Ø 0.25 (6.4)	Ø 0.50 (12.7)
C	0.75 (19)	1.00 (25.4)
D	0.88 (22.5)	1.75 (45) - SST 1.92 (49) - HC and Monel
E	0.31 (8)	0.63 (16)
F	1.25 (31.75)	—

MODEL NUMBER

RIGID SINGLE ROD PROBE FOR LIQUIDS (FOR IN-TANK MOUNTING ONLY)

- 316/316L (1.4401/1.4404) material for standard applications
- Hastelloy C (2.4819) or Monel (2.4360) for extreme aggressive media
- PFA insulated for applications with excessive coating / buildup.

 Models available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

BASIC MODEL NUMBER

7 * F	Standard single rod GWR probe	$\epsilon_r \geq 1.9/10$ ①
7 * J	High temperature / high pressure single rod GWR probe	$\epsilon_r \geq 1.9/10$ ①

*Specify "E" for English (e.g., 7EF) or "M" for Metric (e.g., 7MF)

MATERIAL OF CONSTRUCTION

A	316/316L (1.4401/1.4404) stainless steel
B	Hastelloy C (2.4819)
C	Monel (2.4360)
J	316/316L SS NACE Construction
4	PFA insulated 316/316L (1.4401/1.4404) stainless steel (for 7xF only)

PROCESS CONNECTION – SIZE/TYPE

Threaded

4 1	2" NPT thread
4 2	2" BSP (G2) thread

ANSI Flanges ②

4 3	2"	150# ANSI RF
4 4	2"	300# ANSI RF
4 5	2"	600# ANSI RF
4 K	2"	600# ANSI RJ
4 M	2"	900/1500# ANSI RJ
5 3	3"	150# ANSI RF flange
5 4	3"	300# ANSI RF flange
5 5	3"	600# ANSI RF flange
5 K	3"	600# ANSI RJ flange
5 L	3"	900# ANSI RJ flange
5 M	3"	1500# ANSI RJ flange
6 3	4"	150# ANSI RF flange
6 4	4"	300# ANSI RF flange
6 5	4"	600# ANSI RF flange
6 K	4"	600# ANSI RJ flange
6 L	4"	900# ANSI RJ flange
6 M	4"	1500# ANSI RJ flange

EN/DIN Flanges ②

D A	DN 50, PN 16	EN 1092-1 Type A
D B	DN 50, PN 25/40	EN 1092-1 Type A
D D	DN 50, PN 63	EN 1092-1 Type B2
D E	DN 50, PN 100	EN 1092-1 Type B2
D F	DN 50, PN 160	EN 1092-1 Type B2
D G	DN 50, PN 250	EN 1092-1 Type B2
E A	DN 80, PN 16	EN 1092-1 Type A
E B	DN 80, PN 25/40	EN 1092-1 Type A
E D	DN 80, PN 63	EN 1092-1 Type B2
E E	DN 80, PN 100	EN 1092-1 Type B2
E F	DN 80, PN 160	EN 1092-1 Type B2
E G	DN 80, PN 250	EN 1092-1 Type B2
F A	DN 100, PN 16	EN 1092-1 Type A
F B	DN 100, PN 25/40	EN 1092-1 Type A
F D	DN 100, PN 63	EN 1092-1 Type B2
F E	DN 100, PN 100	EN 1092-1 Type B2
F F	DN 100, PN 160	EN 1092-1 Type B2
F G	DN 100, PN 250	EN 1092-1 Type B2

PROCESS SEAL – O-RING MATERIAL

For 7xF

0	Viton® GFLT seal: for universal use	-40° F (-40° C) / +300° F (+150° C)
2	Kalrez 4079 seal: for aggressive media	-40° F (-40° C) / +300° F (+150° C)
8	Aegis PF 128 seal: for aggressive media	-20° C (-4° F) / +300° F (+150° C)

For 7xJ

8	PEEK/Aegis PF 128 seal	-0° F (-15° C) / +600° F (+315° C)
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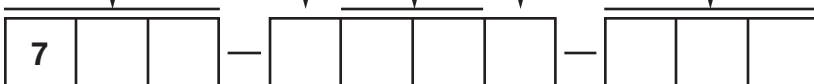
Consult factory for alternative o-ring materials. For Ammonia/Chlorine applications, use the 7xD GWR probe. Viton® is a registered trademark of DuPont Performance Elastomers.

INSERTION LENGTH

24 to 240 inches (60 to 610 cm)
(unit of measure is determined by second digit of Model Number)
Examples: 24 inches = 024; 60 centimeters = 060

① For dielectric range ≤ 1.9 and 10, probe must be mounted within 2–6 inches (50–150 mm) distance from the tank wall or in a cage or bridle. See mounting consideration on page 25.

② 7xF up to 600# ANSI RF / PN 100 flanges.



“IN TANK” STANDARD SINGLE ROD PROBE MOUNTING CONSIDERATIONS

1. Turbulence

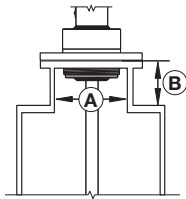
For 7xF (single rod)

The bottom of the probe should be stabilized if turbulence will cause a deflection of more than 3" at 10' (75 mm at 3 m) of length. The probe should not make contact with metal. A TFE bottom spacer for 7xF GWR probes or PEEK spacer for 7xJ is optional.

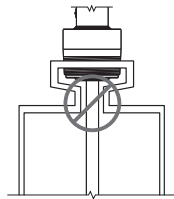
2. Nozzles: do not restrict the performance by ensuring the following:

For 7xF/7xJ (single rod):

1. Nozzle must be 50 mm (2") or larger diameter.
2. Nozzle inside diameter (A) should be \geq to nozzle height (B). If this is not the case, it is recommended to adjust BLOCKING DISTANCE and/or SENSITIVITY settings.



Correct installation



Pipe reducers should not be used

3. Metallic (conductive) obstructions in tank.

For 7xF (single rod)

A metal stillwell/cage of max. 6"/DN150 size or a metal tank wall within 150 mm of the probe mounting will allow the unit to operate accurately in media with dielectrics down to ϵ_r 1.9. Objects in the proximity can cause erroneous readings

Distance to probe	Acceptable objects
< 150 mm (6")	Continuous, smooth, parallel, conductive surface (e.g. metal tank wall); probe should not touch tank wall
> 150 mm (6")	< 1"/DN25 diameter pipe and beams, ladder rungs
> 300 mm (12")	< 3"/DN80 diameter pipe and beams, concrete walls
> 450 mm (18")	All remaining objects

4. Non-metallic vessels

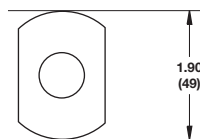
For 7xF (single rod)

Flange (metal) mounting is recommended for optimum performance.

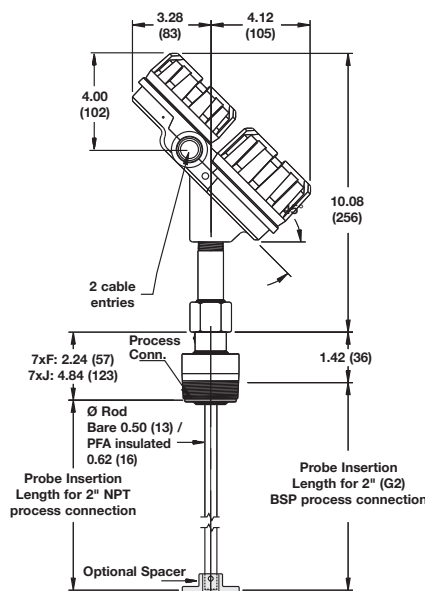
High level shutdown / Overfill protection

Special consideration is necessary in any high level shutdown / overfill protection application where single rod GWR probes are used. To ensure proper measurement, the guided wave radar probe should be installed so the maximum overfill level is at a minimum of 120 mm (4.8") up to 910 mm (36") – blocking distance depending application below the process connection. Consult factory for further information.

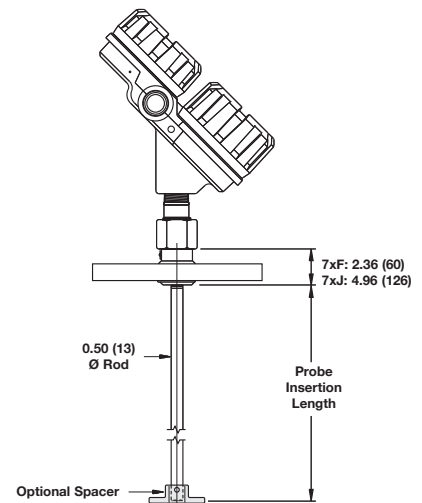
RIGID SINGLE ROD PROBE DIMENSIONS INCHES (m m)



Spacer (end view)



**7xF/7xJ
with threaded connection
max. 240" (6 m)**



**7xF/7xJ
with flanged connection
max. 240" (6 m)**

MODEL NUMBER

PFA INSULATED / FACED-FLANGE PROBE FOR AGGRESSIVE LIQUIDS (FOR IN-TANK MOUNTING ONLY)

BASIC MODEL NUMBER

7 * F-F	Single rod PFA insulated 316/316L (1.4401/1.4404) GWR probe	$\epsilon_r \geq 1.9/10$ ①
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*Specify "E" for English (e.g., 7EF-F) or "M" for Metric (e.g., 7MF-F)

PROCESS CONNECTION – SIZE/TYPE

ANSI Flanges

4 3	2"	150#	ANSI RF flange
4 4	2"	300#	ANSI RF flange
4 5	2"	600#	ANSI RF flange
5 3	3"	150#	ANSI RF flange
5 4	3"	300#	ANSI RF flange
5 5	3"	600#	ANSI RF flange
6 3	4"	150#	ANSI RF flange
6 4	4"	300#	ANSI RF flange
6 5	4"	600#	ANSI RF flange

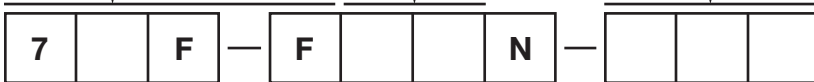
EN/DIN Flanges

D A	DN 50, PN 16	EN 1092-1 Type A
D B	DN 50, PN 25/40	EN 1092-1 Type A
D D	DN 50, PN 63	EN 1092-1 Type B2
D E	DN 50, PN 100	EN 1092-1 Type B2
E A	DN 80, PN 16	EN 1092-1 Type A
E B	DN 80, PN 25/40	EN 1092-1 Type A
E D	DN 80, PN 63	EN 1092-1 Type B2
E E	DN 80, PN 100	EN 1092-1 Type B2
F A	DN 100, PN 16	EN 1092-1 Type A
F B	DN 100, PN 25/40	EN 1092-1 Type A
F D	DN 100, PN 63	EN 1092-1 Type B2
F E	DN 100, PN 100	EN 1092-1 Type B2

INSERTION LENGTH

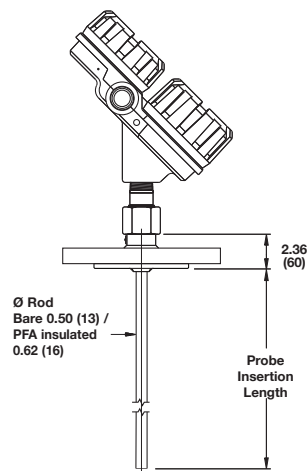
24 to 240 inches (60 to 610 cm) (unit of measure is determined by second digit of Model Number) Examples: 24 inches = 024; 60 centimeters = 060

① For dielectric range ≤ 1.9 and 10, probe must be mounted within 2–6 inches (50–150 mm) distance from the tank wall or in a cage or bridle. See mounting consideration on page 21.



PFA PROBE DIMENSIONS

INCHES (m m)



7xF-F
with PFA faced-flanged connection
max. 240" (6 m)



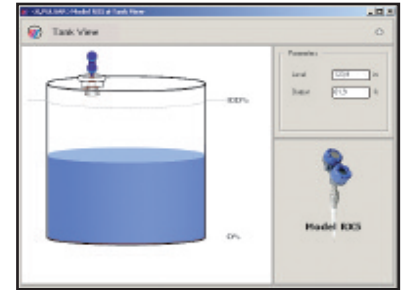
The Most Efficient PC Configuration Tool for Eclipse® Guided Wave Radar Transmitters

PACTware is the modern, user-friendly adjustment software that enables quick configuration and diagnostics of your radar transmitters. With your PC connected through a serial interface to the HART loop, all functionality can be managed remotely anywhere on the loop.



GET CONNECTED Simply connect the HART/RS232 or HART/USB serial interface from the PC to the two-wire loop.

Level Monitoring Screen Continuously viewing the level in a tank is the starting point for PACTware. The position of liquid level can be viewed in a simple visual format on your PC. Level and Output values are shown numerically as well. The screen can be left open to show the relative position of the liquid level.



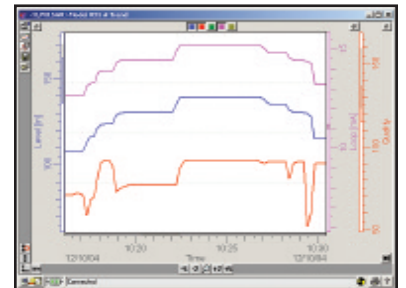
Level Monitoring Screen

Parameters Screen Every parameter in your radar transmitter can be monitored and modified remotely with a few clicks of the mouse. From units of measure to settings for dielectric, each parameter can be viewed or changed to suit application conditions. Parameters can be developed offline or transferred between transmitters.



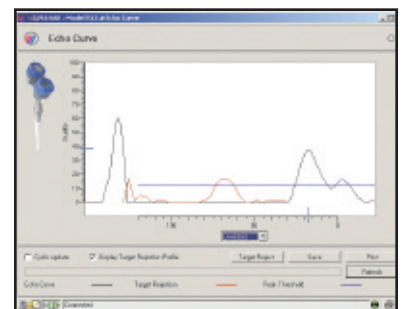
Parameters Screen

Trending Screen The ability to trend data over a period of time allows insight into overall operation of your radar. Trending values are invaluable when attempting advanced configuration or troubleshooting. PACTware PC software has the ability to track all parameters of your radar device and save them as a text or picture file.



Process Trend Screen

Echo Wave Form Screen This screen yields a wealth of useful information: Level (X-axis); Signal Quality (Y-axis); Actual Echo Curve (black line); False Target Profile (red line); and Minimum Threshold (blue line). Blue hash marks show the location and signal quality of the target currently detected as liquid level. False Target Rejection—a common issue among all non-contact, transit-time devices—can be accessed from this screen.



Echo Wave Form Screen

QUALITY



The quality assurance system in place at Magnetrol guarantees the highest level of quality throughout the company. Magnetrol is committed to providing full customer satisfaction both in quality products and quality service.

The Magnetrol quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

ESP

Expedite Ship Plan

Several Models of ECLIPSE Guided Wave Radar Transmitters are available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

Models covered by ESP service are color coded in the selection data charts.

To take advantage of ESP, simply match the color coded model number codes (standard dimensions apply).

ESP service may not apply to orders of ten units or more. Contact your local representative for lead times on larger volume orders, as well as other products and options.

WARRANTY



All Magnetrol electronic level and flow controls are warranted free of defects in materials or workmanship for eighteen months from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol will repair or replace the control at no cost

to the purchaser (or owner) other than transportation.

Magnetrol shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol products.

For additional information, see Instruction Manual 57-600.

ECLIPSE Guided Wave Radar transmitters may be protected by one or more of the following U.S. Patent Nos. US 6,062,095; US 6,247,362; US 6,588,272; US 6,626,038; US 6,640,629; US 6,642,807; US 6,690,320; US 6,750,808; US 6,801,157; US 6,867,729; US 6,879,282; 6,906,662. May depend on model.



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