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 hardware systems.

Eclipse supports the FDT/DTM standard and, with the PACT*ware*™ Frame Program, allows for additional configuration and trending flexibility.

Measures Level, Volume, and Interface

SIL 2

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)).
- Suited for SIL 1 or SIL 2 Loops (full FMEDA report available).

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

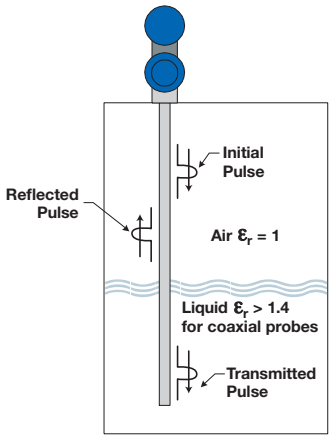
Eclipse Guided Wave Radar is based upon the technology of TDR (Time Domain Reflectometry). TDR utilizes pulses of electromagnetic energy transmitted down a wave guide (probe). When a pulse reaches a liquid surface that has a higher dielectric constant than the air (ε_r of 1) in which it is traveling, 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

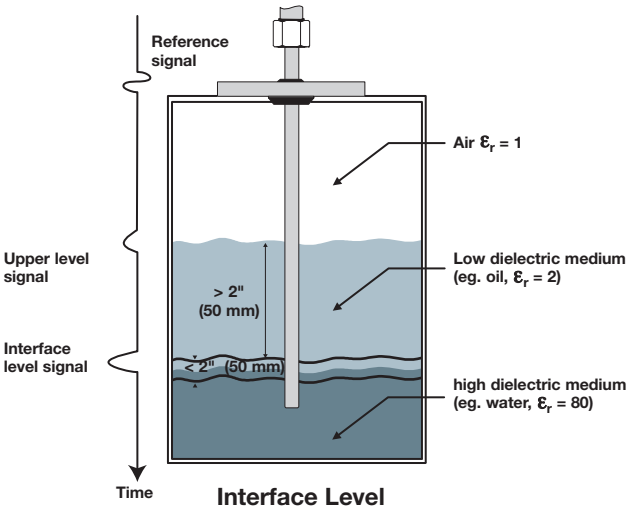
The Eclipse Model 705 is capable of measuring both an upper liquid level and an interface liquid level. Even after the pulse is reflected from the upper surface, some of the energy continues down the GWR probe through the upper liquid. The pulse is again reflected when it reaches the higher dielectric 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 ($\varepsilon_r \approx 2.0$), and the lower layer of water being very conductive ($\varepsilon_r \approx 80$). 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

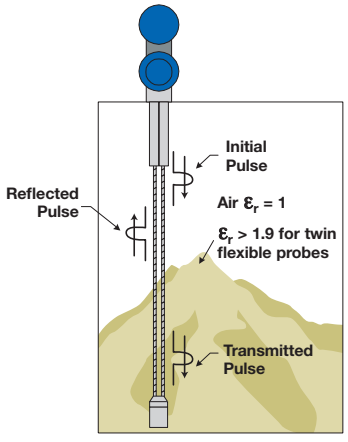
As emulsion layers can decrease the strength of the reflected signal, the Eclipse Model 705 should only be utilized in those interface applications that have clean, distinct layers. Contact factory for application assistance.



Overall Liquid Level



Interface Level



Bulk Solid 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, twin element (rod or cable) and single element (rod or cable) are the three basic configurations used today; each with specific strengths and weaknesses.

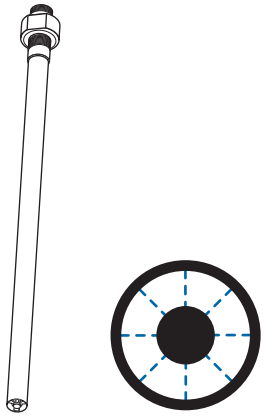


Figure 1
Coaxial Probe

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 ($\varepsilon_r \geq 1.4$) applications. The sensitivity of this "closed" design, however, also makes it more susceptible to measurement error in applications of coating and buildup.

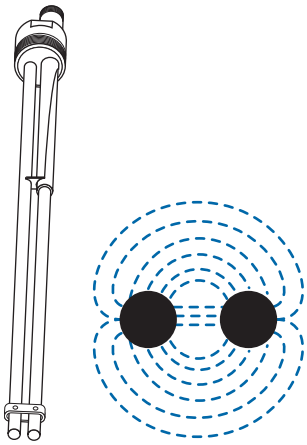


Figure 2
Twin Rod Probe

TWIN ROD PROBES

The relationship of the Twin Rod probe to a Coaxial is similar to that of older, twin-lead, antenna lead-in to modern, coaxial cable. 300 ohm twin-lead cable simply does not have the efficiency of 75-ohm coax. The parallel conductor design is less sensitive than the concentric coaxial. See Figure 2. This translates to Twin Rod GWR probes measuring dielectrics of only $\varepsilon_r \geq 1.9$.

The "open" design also allows more accurate measurement where coating/buildup are possible. A film coating has little effect on performance. However, bridging of material between the rods or buildup on the spacers can cause improper measurement and should be avoided. Figure 2 also shows that the electromagnetic field develops not only between the rods, it also expands outward making it more sensitive to proximity effects of objects located immediately around it.

PROBE OVERVIEW

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 3 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 $\varepsilon_r > 10$. This dielectric performance improves considerably ($\varepsilon_r > 1.9$) 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.

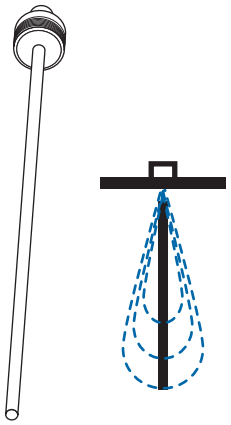


Figure 3
Single Rod Probe

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.

For more details – refer to bulletin 57-110.

¾" Hygienic Connection without bend

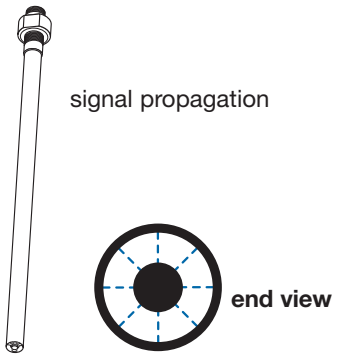
0.25 inch diameter probes suitable for use in smaller vessels where space is at a premium. Available in lengths up to 72 inches.

1½" Hygienic Connection with bend

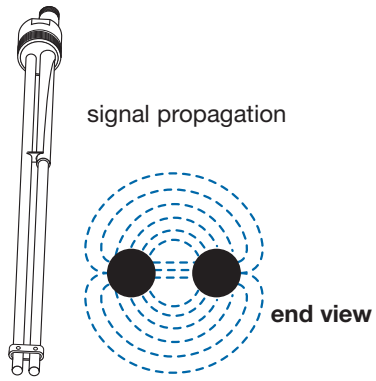
316 SS probes can be bent to avoid internal obstructions such as agitator blades and spray balls, and to insure lowest possible level detection.

SELECTION GUIDE

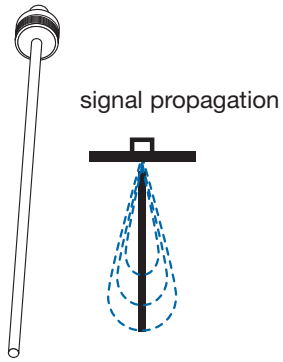
COAXIAL TYPE GWR PROBE



TWIN ROD/CABLE TYPE GWR PROBE



SINGLE ROD/CABLE TYPE



Application	Dielectric Limit	Temperature Limits	Pressure	Applications			GWR Probe
				Vacuum ①	Overfill Safe	Foam ②	
Coaxial GWR Probes: Maximum Viscosity 500 cP (I.D. ¾") – 1500 cP (I.D. 1¾")							
Level	ε_r 1.4–100	-40° to +400° F (-40° to +200° C)	max 1015 psig (70 bar)	Yes	Yes	No	**7xR 7xM**
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 +650° F (up to +345° C)	max 2250 psig (155 bar)	Yes	No	No	**7xS**
Interface	ε_r 1.4–100	-40° to +400° F (-40° to +200° C)	max 1015 psig (70 bar)	Yes	Yes	No	**7xT 7xN**
Twin Rod/Cable GWR Probes: Maximum Viscosity 1500 cP							
Liquids – Rod	ε_r 1.9–100	-40° to +400° F (-40° to +200° C)	max 1000 psig (70 bar)	Yes	No	Yes	**7xB**
Liquids – Cable (level/interface)	ε_r 1.9–100	-40° to +400° F (-40° to +200° C)	max 1000 psig (70 bar)	Yes	No	No	**7x7**
Solids – Cable	ε_r 1.9–100	Ambient	Atmospheric	Yes	No	n/a	**7x5**
Single Rod/Cable 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**
Liquids – Cable ④	ε_r 1.9–100	-40° to +300° F (-40° to +150° C)	max 1000 psig (70 bar)	Yes	No	Yes	**7x1**
Solids – Cable	ε_r 4–100	Ambient	Atmospheric	Yes	No	n/a	**7x2**
High Temp./ High Pressure ④	ε_r 1.9–100	-40° to +600° F (-40° to +315° C)	max 3002 psig (207 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^{-8} 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.

TRANSMITTER SPECIFICATIONS

FUNCTIONAL/PHYSICAL

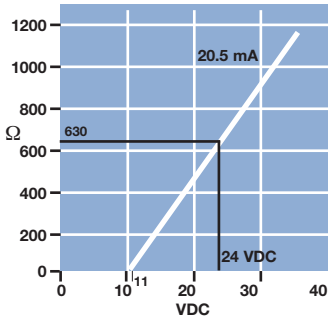
Power (at terminals)	General Purpose / Intrinsically Safe		11 to 28.6 VDC
	Explosion Proof (with Intrinsically Safe probe)		11 to 36 VDC
	FOUNDATION fieldbus™ and PROFIBUS PA™ (FISCO)		9 to 17.5 VDC
	FOUNDATION fieldbus™ and PROFIBUS PA™ (FNICO Exd)		9 to 32 VDC
Signal Output	4–20 mA with HART®	3.8 mA to 20.5 mA useable (meets NAMUR NE 43)	
	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 PACT*ware*®, 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	
Electrical Data		Ui = 28.4 V, Ii = 94 mA, Pi = 0.67 W Ci = 0.56 V, Ii = 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 (45 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 × PB, 4 × AI blocks, 1 × 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/twin lead 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 ②	Coaxial/twin lead 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)



GENERAL PURPOSE (GP)
INTRINSICALLY SAFE (IS)
EXPLOSION PROOF (XP)

① Specifications will degrade with Model 7xB, 7xD, and 7xP probes and/or Fixed threshold configuration.
② Top 24 inches of Model 7xB probe: 1.2 inches (30 mm).

PROBE SPECIFICATIONS

Description		**7xD / 7xL: High Pressure / High Temperature GWR Probe**	**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
	Spacers	Alumina (7xD-A, B and C) – TFE (7xD-W) – High Temp PEEK (7xD-V, N, P and R)	High Temp PEEK
Probe diameter	Standard coax	Inner rod 0.31" (8 mm) – outer tube 0.87" (22.5 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 **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)	$\varepsilon_r \geq 10$ = 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 +400° F @ 5700 psi (+200° C @ 393 bar) for 7xx-W	+650° F @ 2250 psi (+345° C @ 155 bar)
	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)	2250 psi @ +650° F (155 bar @ +345° C)
Max. Viscosity		500 cP (standard) / 1500 cP (enlarged)	500 cP
Dielectric Range		$\varepsilon_r \geq$ 1.4-100: 7xx-W, V, N, P and R $\varepsilon_r \geq$ 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

① Consult factory for insertion length < 24" (60 cm).
② Transition Zone (zone with reduced accuracy) is dielectric dependent; ε_r = dielectric permitivity. It is recommended to set 4–20 mA signal outside transition zones.
③ Consult factory for overfill applications.
④ See tables on page 9.

PROBE SPECIFICATIONS

Description		**7xT / 7xN: Interface GWR Probe 7xR / 7xM: Overfill Protection Coaxial Probe**	**7xB: Standard Twin Rod 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)	Two 0.5" (13 mm) Ø rods – 22 mm (0.875") ℄ to ℄
	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	In-tank mounting only. Twin rod probe must be used in metallic vessel or stillwell > 1" (25 mm) from any surface or obstruction
Process Connection		**Threaded:** ¾" NPT or 1" BSP (G1) – except for enlarged probe **Flanged:** Various ANSI, DIN or "proprietary" mating flanges	**Threaded:** 2" NPT or 2" BSP (G2) **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	$\varepsilon_r \geq 1.9$ = 6" (150 mm)
	Bottom	ε_r: 1.4 = 6" (150 mm)/ε_r: 80 = 2" (50 mm)	ε_r: 1.9 = 6" (150 mm)/ε_r: 80 = 1" (25 mm)
Process Temp.	Max	+400° F @ 270 psi (+200° C @ 18 bar)	
	Min	-40° F @ 750 psi (-40° C @ 50 bar)	
Max. Process Pressure ③		1000 psi @ +70° F (70 bar @ +20° C)	1000 psi @ +70 °F (70 bar @ +20° C)
Max. Viscosity		500 cP	1500 cP
Dielectric Range		Upper liquid: ≥ 1.4 and ≤ 5, Lower liquid: ≥ 15	1.9 to 100
Vacuum service		Negative pressure but not hermetic seal	
Media coating		In case of media coating, select 7xN probe.	Film: 3% error of coated length, bridging not recommended ④

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 25	
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 ② (bottom)		$\varepsilon_r \geq 10$: 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) for 7xF-F	
Max Process Pressure		1000 psi @ +70° F (70 bar @ +20° C)	3000 psi @ +70° F (207 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 $\varepsilon_r \geq 1.9$) – 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 Consult factory for insertion length < 24" (60 cm)
② Transition Zone (zone with reduced accuracy) is dielectric dependent; ε_r = dielectric permitivity. It is recommended to set 4–20 mA signal outside transition zones.
③ See tables on page 9.
④ Bridging is defined as continuous accumulation of material between the probe elements.

Viton® is a registered trademark of DuPont Performance Elastomers.

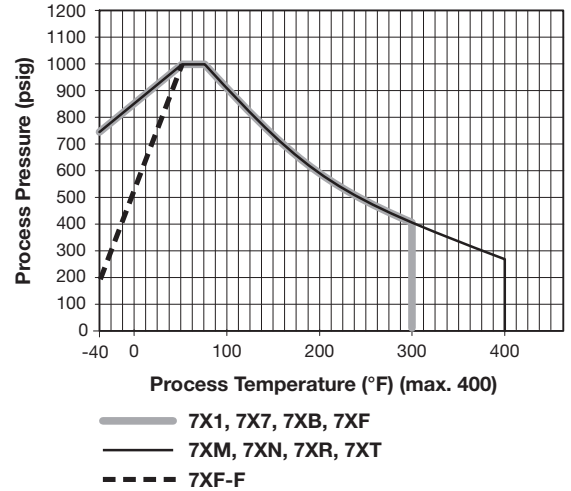
PROBE SPECIFICATIONS

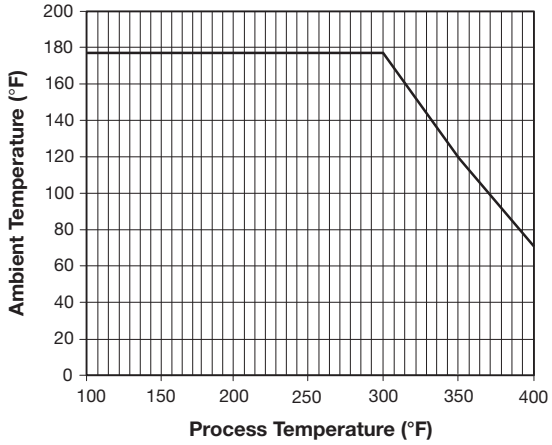
Description		7x1 (liquids) / 7x2 (solids): Single Flexible	7x5 (solids) / 7x7 (liquids): Twin Flexible
Materials	Probe	316 SST (1.4401)	7x7: FEP coated 316 SST (1.4401) 7x5: TFE coated 316 SST (1.4401)
	Process seal	TFE with Viton® GFLT, EPDM or Kalrez 4079 (Consult factory for alternatives)	
Probe diameter		7x1: 0.19" (5 mm) 7x2: 0.25" (6 mm)	0.25" (6 mm)
Mounting		See mounting considerations on page 25	< 1" (25 mm) from any surface or construction
Process Connection		Threaded: 2" NPT or 2" BSP (G2) – Flanged: Various ANSI, EN/DIN or hygienic	
Probe length		From 3' (1 m) (7x1) - 6' (2 m) (7x2, 7x5, 7x7) to max 75' (22 m) (1 foot or 1 meter)	
Blocking distance (top)		4.8" up to 36" (120 up to 910 mm) depending probe length (adjustable)	12" to 20" (300 to 500 mm)
Transition Zone ① (bottom)		12" (305 mm)	
Process Temperature	Maximum	7x1: 300° F (+150° C) / 7x2: 150° F (+66° C)	7x7: 300° F (+150° C) / 7x5: 150° F (+66° C)
	Minimum	-40° F (-40° C)	-40° F (-40° C)
Max Process Pressure		7x1/7x7: 1000 psi @ +70° F (70 bar @ +20° C) 7x2/7x5: 50 psi (3.4 bar)	
Max Viscosity		10.000 cP – consult factory in case of agitation/turbulence	1500 cP
Dielectric Range		ε_r 10-100 (depending installation conditions down to $\varepsilon_r \geq 1.9$) – liquids ε_r 4-100 – solids	ε_r 1.9-100
Mechanical load		20 lbs (9 kg) – 7x1	
Pull-down force		3000 lbs (1360 kg) – 7x2	3000 lbs (1360 kg) – 7x5
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; εr = dielectric permitivity. It is recommended to set 4–20 mA signal outside the transition zone / blocking distance.

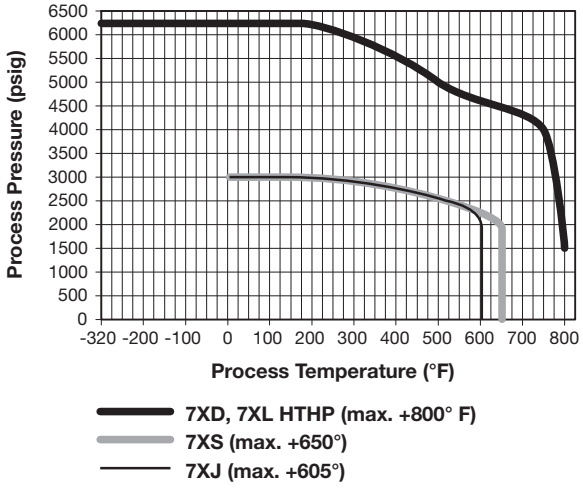
TEMPERATURE/PRESSURE RATING

FOR ECLIPSE PROBE SEALS





Ambient Temperature vs Process Temperature
7XB, 7XF, 7X7



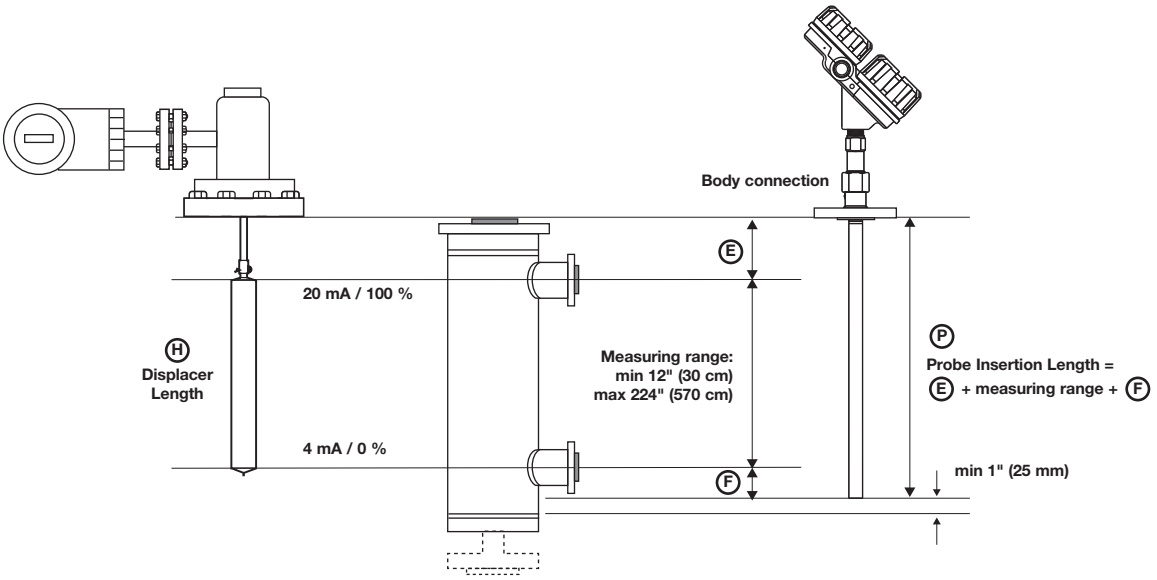
REPLACEMENT OF DISPLACER TRANSMITTER

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 16 to 27.
- **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., 7xG, 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"
  - Twin rod type: min 3"
  - Caged GWR type: 2"



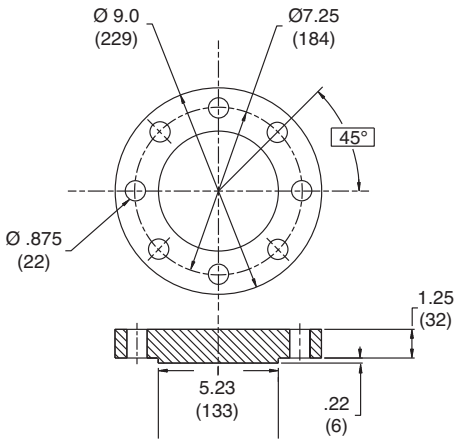
Recomended probe length for replacing displacer transmitters

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 Modulevel®	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)

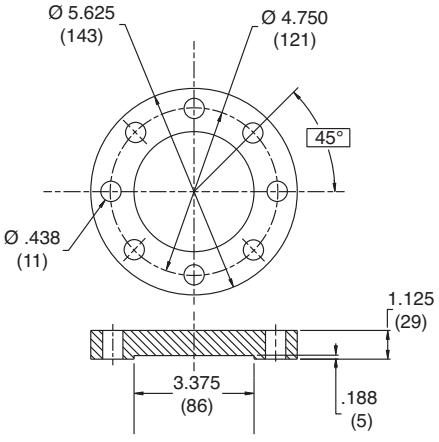
① Round down resulting calculation to the nearest inch.

PROPRIETARY FLANGES



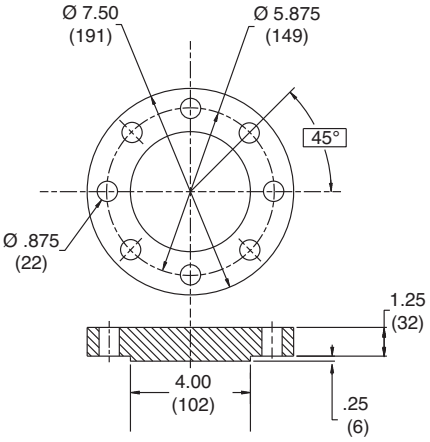
Fisher 249B/259B (600 lb.), carbon steel

Figure 1



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

Figure 2



Masoneilan (600 lb.), carbon steel

Figure 3

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 57-140.

AURORA®

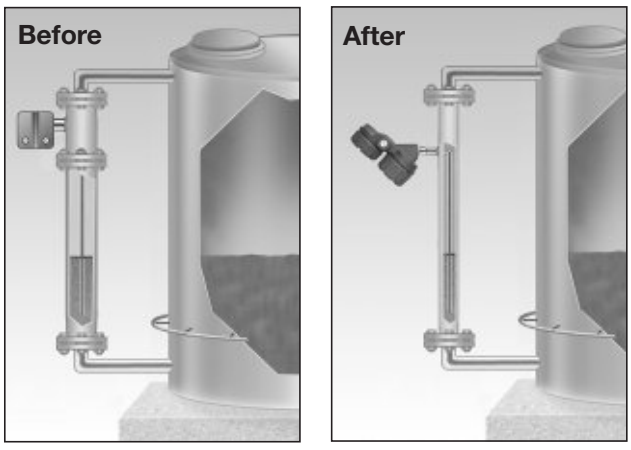
The Orion Instruments Aurora® is the innovative combination of the Eclipse Guided Wave Radar transmitter and a Magnetic Level Indicator (MLI). The integration of these two independent technologies provides excellent redundancy. The float positioned within the Aurora chamber moves up and down according 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.

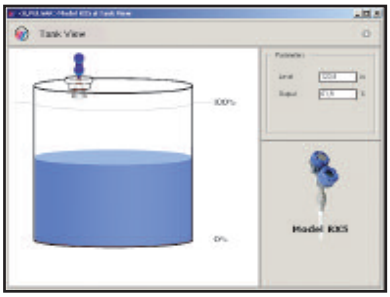


The Most Efficient PC Configuration Tool for Eclipse Guided Wave Radar Transmitters

PACT*ware* *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.*

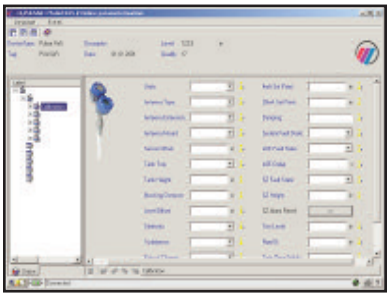
GET CONNECTED Simply connect the HART/RS232 or HART/USB serial interface from the PC to the two-wire loop.

Level Monitoring Screen Continuously viewing the level in a tank is the starting point for PACT*ware*. 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.



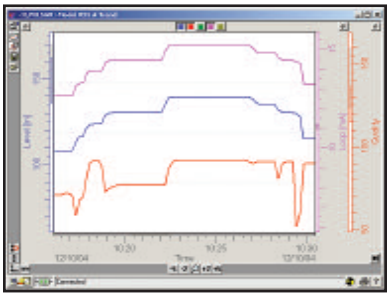
Level Monitoring Screen

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.



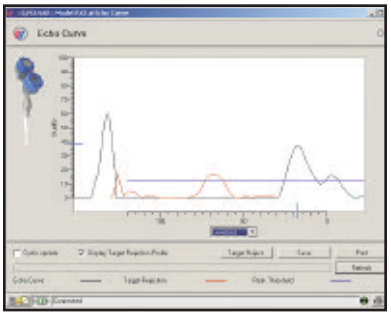
Parameters Screen

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

AGENCY APPROVALS

AGENCY	MODEL APPROVED	APPROVAL CATEGORY	APPROVAL CLASSES
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; Group 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; Group 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; Group E, F & G T4 Class III, Type 4X
IEC	705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe ③	Zone 0 Ex ia IIC T4
ATEX	705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe ③	Ex II 1G, EEx ia IIC T4
	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

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.

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 enhanced electronics (SFF of 91%)
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 ①
7	Cast aluminum, dual compartment, 45° angle, 12-ft remote
8	316 stainless steel, dual compartment, 45° angle, 12-ft remote ①

CONDUIT CONNECTION

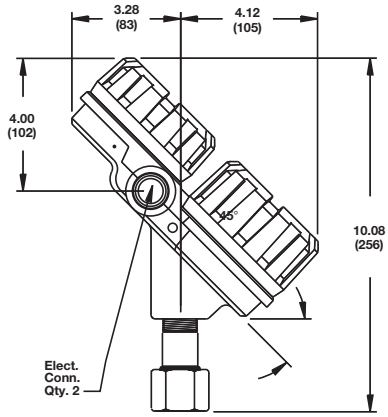
0	¾" NPT
1	M20

① 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, C or F) when ordering the heavier 316 SS version.

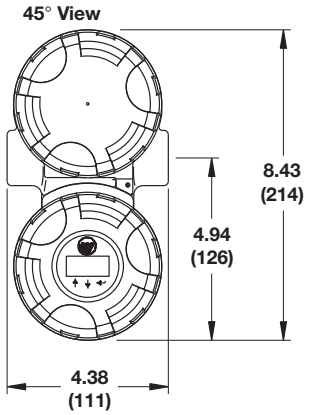
7	0	5	—	5				—			

DIMENSIONS

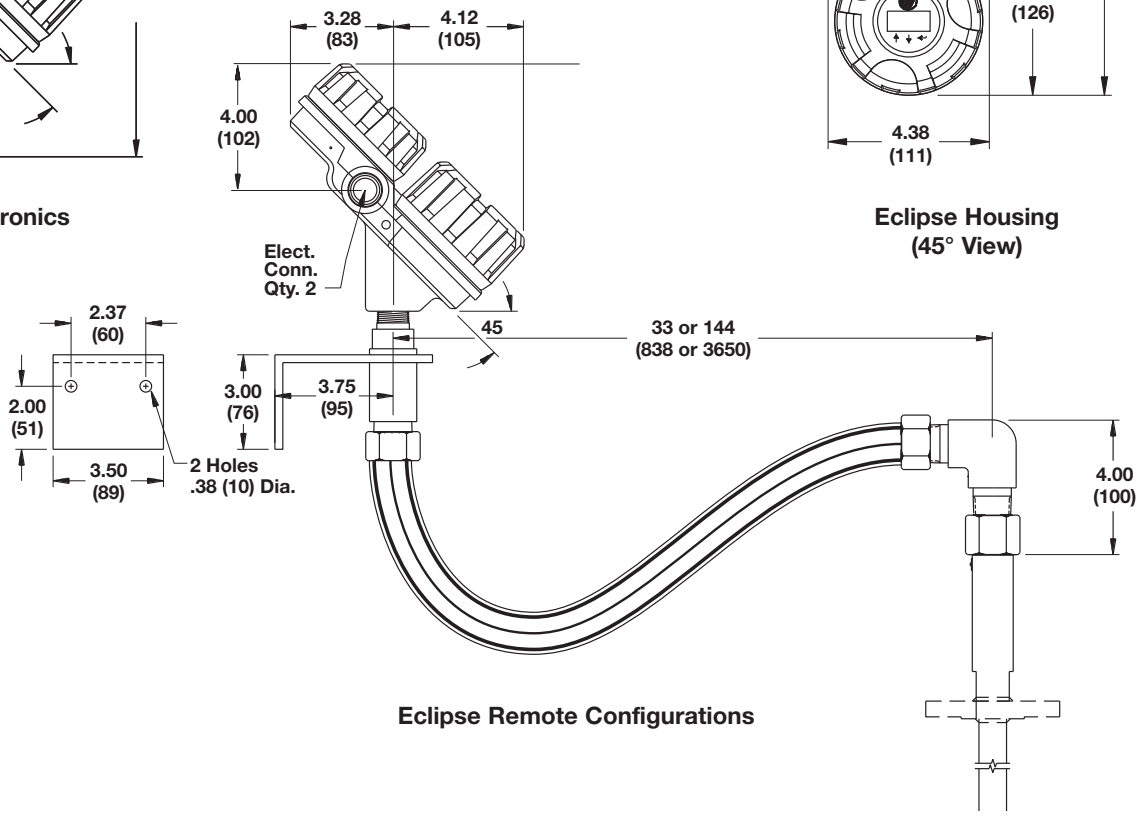
inches (mm)



Integral Electronics

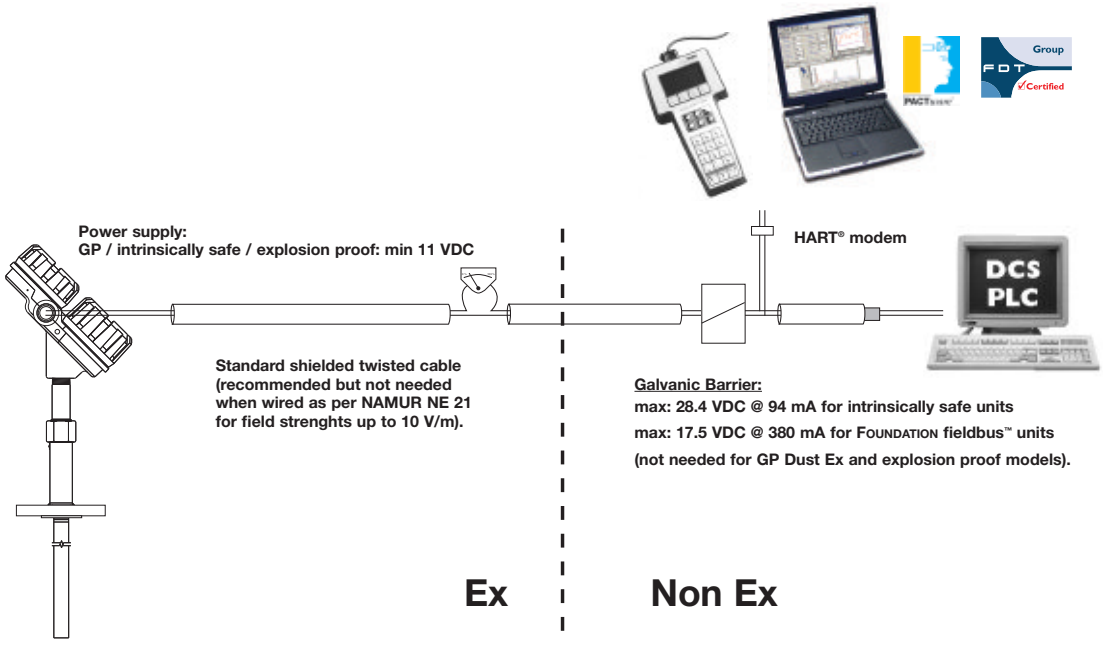


Eclipse Housing (45° View)



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

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

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	¾" 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 1 on page 11
T U	600# Fisher (249C) in stainless steel –	as per dimensions of Figure 2 on page 11
U T	600# Masoneilan flange in carbon steel –	as per dimensions of Figure 3 on page 11
U U	600# Masoneilan flange in stainless steel –	as per dimensions of Figure 3 on page 11

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

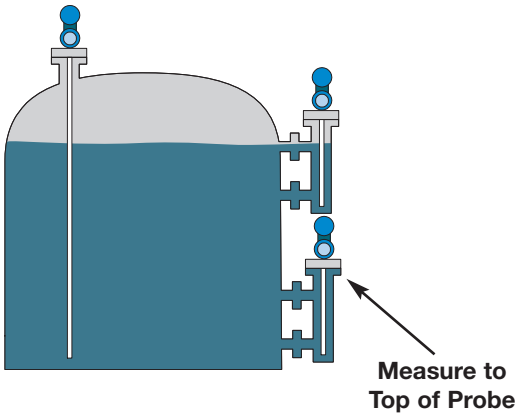
24 to 240 inches (60 to 610 cm)
(unit of measure is determined by second digit of Model Number)

Examples: 24 inches = 024; 60 centimeters = 060

7			—					—			

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

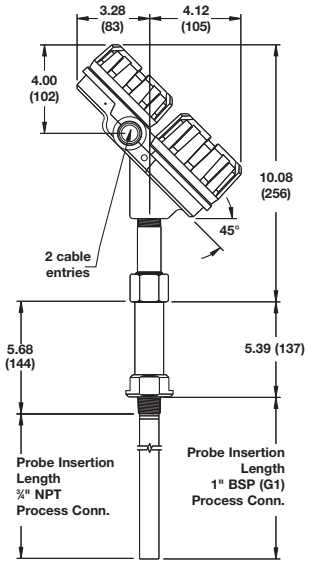
Eclipse 7xR, 7xM, 7xT and 7xN coaxial type GWR probes are "overfill safe" in operation and "Overfill proof" certified.

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

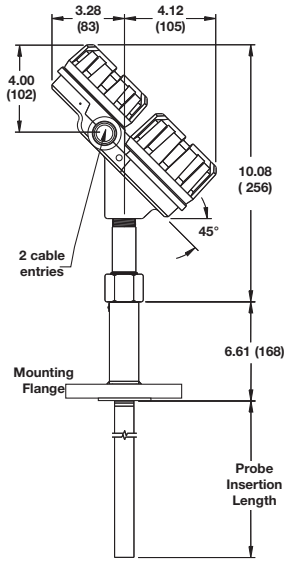
Overfill proof protection (such as WHG or VLAREM) certifies reliable operation when the transmitter is used as overfill alarm but assumes that the installation is designed in such way that the vessel/ cage cannot overfill.

COAXIAL PROBE DIMENSIONS

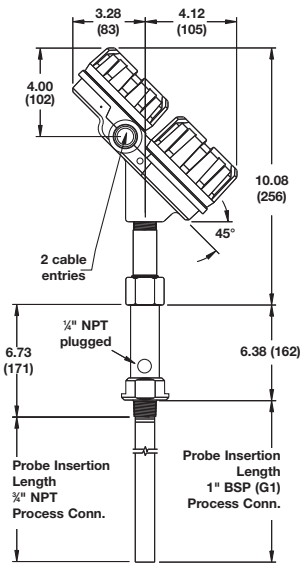
INCHES (mm)



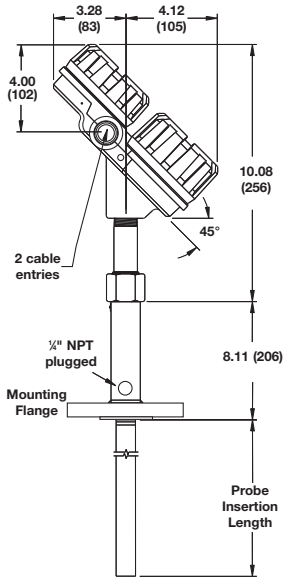
7xR / 7xT with threaded connection



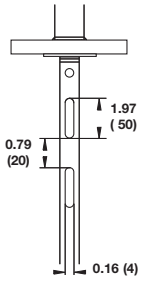
7xR / 7xT with flanged connection



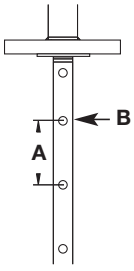
7xM / 7xN with flushing connection



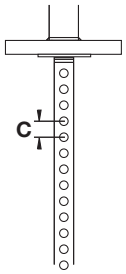
7xM / 7xN with flushing connection



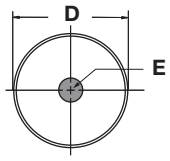
Slots for 7xR-A (order with "x" description)



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

TWIN ROD 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 for in-tank mounting only

7 * B	Twin Rod GWR probe $\varepsilon_r \geq 1.9$ - WHG approved

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

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

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

PROCESS CONNECTION – SIZE/TYPE

Threaded

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

ANSI Flanges

5 3	3"	150# ANSI Raised Face Flange
5 4	3"	300# ANSI Raised Face Flange
6 3	4"	150# ANSI Raised Face Flange
6 4	4"	300# ANSI Raised Face Flange

EN/DIN Flanges (consult factory for DN 50 process connections)

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
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

Torque Tube Mating Flanges ①

T T	600# Fisher (249B/259B) in carbon steel –	as per dimensions of Figure 1 on page 11
T U	600# Fisher (249C) in stainless steel –	as per dimensions of Figure 2 on page 11
U T	600# Masoneilan flange in carbon steel –	as per dimensions of Figure 3 on page 11
U U	600# Masoneilan flange in stainless steel –	as per dimensions of Figure 3 on page 11

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 media③	-40° F (-40° C) / +400° F (+200° C)
8	Aegis PF 128 seal – for NACE applications	-4° F (-20° C) / +400° F (+200° C)

INSERTION LENGTH

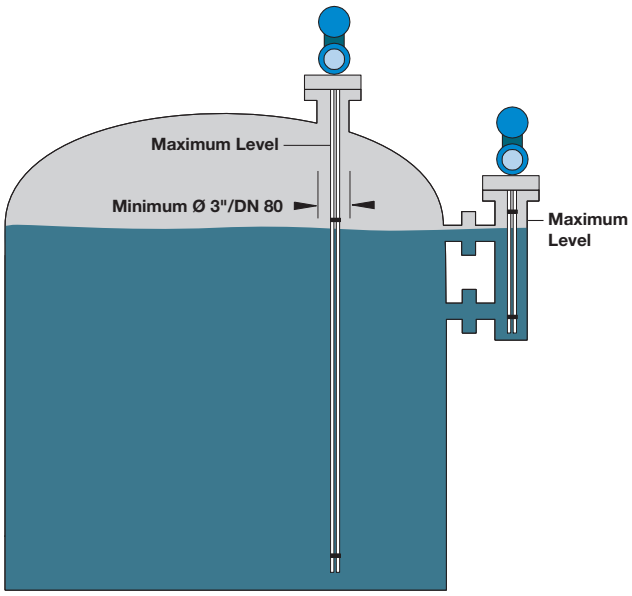
24 to 240 inches (60 to 610 cm)
(unit of measure is determined by second digit of Model Number)

Examples: 24 inches = 024; 60 centimeters = 060

① Always check dimensions if ANSI/DIN flanges are not used.
② Consult factory for alternative o-ring materials.
Consult factory for HF Acid applications.
③ For ammonia/chlorine applications use the 7xD GWR probe.

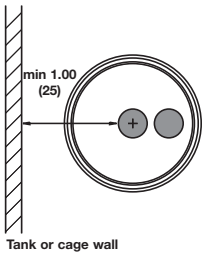
7		B	—					—			

TWIN ROD PROBE MOUNTING



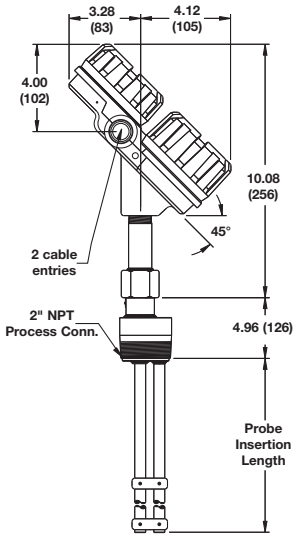
OVERFILL SAFE & OVERFILL PROTECTION

Eclipse Twin Rod GWR probes utilize software algorithms to ignore level readings in the transition zone at the top of the GWR probe. The maximum level is 6" (150 mm) below the process connection. This may include utilizing a nozzle or spool piece to raise the probe. Twin rod probes are overfill proof certified but not overfill safe in use.

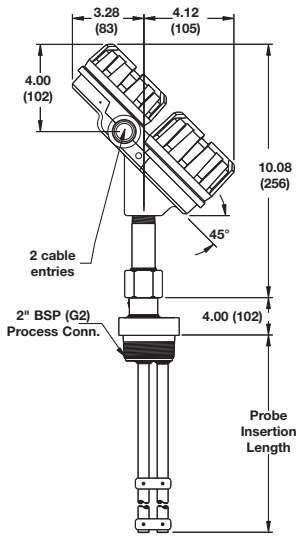


TWIN ROD PROBE DIMENSIONS

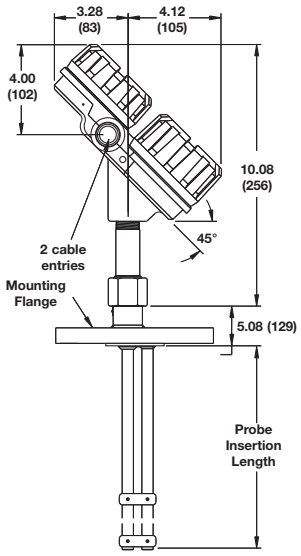
INCHES (mm)



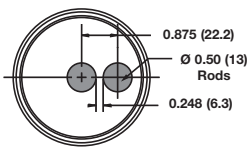
7xB with threaded 2" NPT connection



7xB with threaded 2" BSP (G2) connection



7xB with flanged connection



Twin Rod GWR Probe, end view

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	$\varepsilon_r \geq 1.4$ - WHG approved ①
7 * L	HTHP GWR probe for level with flushing connection	$\varepsilon_r \geq 1.4$ - 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. ε_r: ≥ 2.0/max +800°F (+427°C)
B	Hastelloy C (2.4819) with ceramic spacers	min. ε_r: ≥ 2.0/max +800°F (+427°C)
C	Monel (2.4360) with ceramic spacers	min. ε_r: ≥ 2.0/max +800°F (+427°C)
J	316/316L SS NACE construction with ceramic spacers	min. ε_r: ≥ 2.0/max +800°F (+427°C)
V	316/316L (1.4401/1.4404) SST with H. Temp PEEK® spacers	min. ε_r: ≥ 1.4/max +650°F (+345°C)
W	316/316L (1.4401/1.4404) stainless steel with Teflon® spacers	min. ε_r: ≥ 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	¾" NPT Thread	2 2	1" BSP (G1) thread

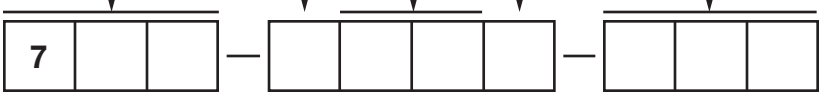
ANSI Flanges

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



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

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)

7			—					—			

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

*Specify "E" for English (e.g., 7ES) or "M" for Metric (e.g., 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	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 ①

T T	600# Fisher (249B/259B) in carbon steel ②
T U	600# Fisher (249C) in stainless steel ②
U T	600# Masoneilan flange in carbon steel ②
U U	600# Masoneilan flange in stainless steel ②

PROCESS SEAL – O-RING MATERIAL

8	Steam Seal (Aegis PF 128 / PEEK)

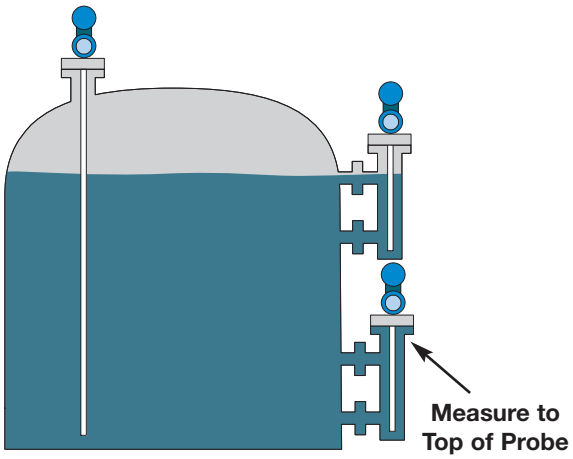
INSERTION LENGTH

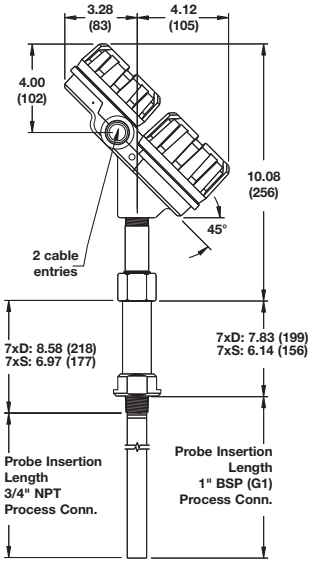
24 to 180 inches (60 to 450 cm) (unit of measure is determined by second digit of Model Number)
Examples: 24 inches = 024; 60 centimeters = 060

7			—					—			

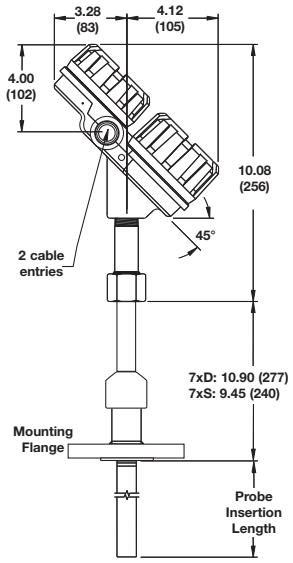
① Always check dimensions if ANSI/DIN flanges are not used.
② As per dimensions on page 10.

INCHES (mm)

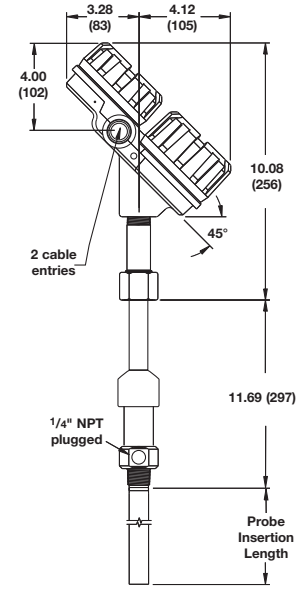




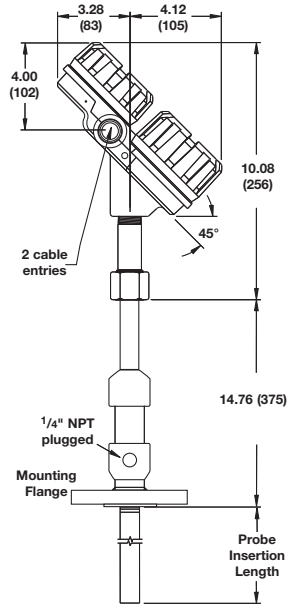
7xD/7xS
with threaded connection



7xD/7xS
with flanged connection



7xL
with threaded connection



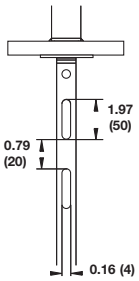
7xL
with flanged connection

OVERFILL SAFE & OVERFILL PROTECTION

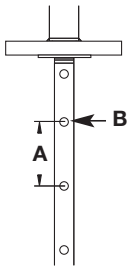
Eclipse 7xD and 7xL coaxial type GWR probes are "Overfill safe" in use and "Overfill proof" certified.

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 overfilling vessel.

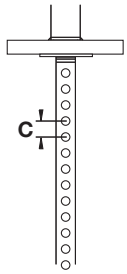
Overfill proof protection (such as WHG or VLAREM) certifies reliable operation when the transmitter is used as overfill alarm but assumes that the installation is designed in such way that the vessel/ cage cannot overfill.



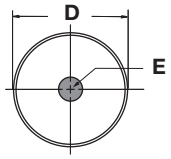
Slots for 7xD - A/V/W
(order per "x" description)



Venting holes
for all



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



Coaxial GWR Probe,
End View

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)

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	$\varepsilon_r \geq 1.9/10$ ①
7 * J	High temperature / high pressure single rod GWR probe	$\varepsilon_r \geq 1.9/10$ 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)

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

7			—					—			

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

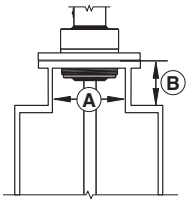
For 7xF/7x1/7x2/7xJ (single rod/cable)

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.

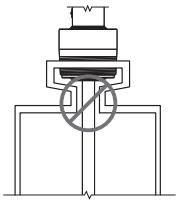
2. Nozzles: do not restrict the performance by ensuring the following:

For 7xF/7x1/7x2/7xJ (single rod/cable):

1. Nozzle must be 50 mm (2") or larger diameter.
2. Nozzle inside diameter (A) should be ≥ 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

For 7x5/7x7 (twin rod/cable):

1. Nozzle should be DN80 (3") diameter or larger.
2. For nozzles < DN80 (3") diameter, the bottom of the inactive section of the probe should be flush with the bottom of the nozzle or extend into the vessel.

3. Metallic (conductive) obstructions in tank.

For 7xF/7x1/7x2 (single rod/cable)

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

For 7x5/7x7 (twin rod/cable)

Mount the probe more than 25 mm (1") from any metallic object/vessel wall.

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/7x1/7x2/7xJ (single rod/cable)

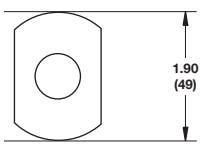
Flange (metal) mounting is recommended for optimum performance.

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.

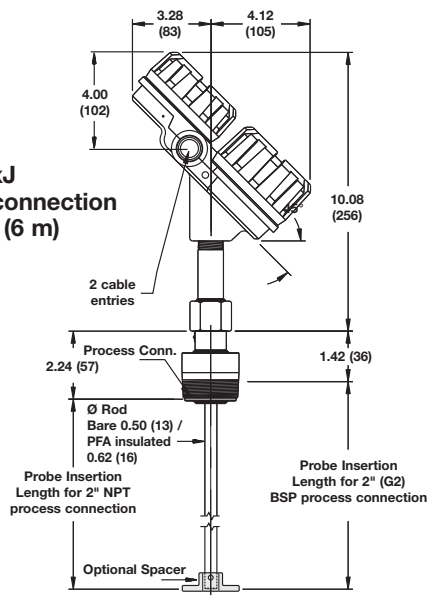
RIGID SINGLE ROD PROBE DIMENSIONS

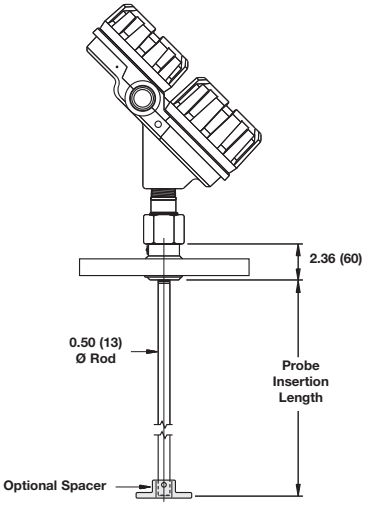
INCHES (mm)



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	$\varepsilon_r \geq 1.9/10$ ①

*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 25.

7		F	—	F			N	—			

FLEXIBLE CABLE PROBES FOR LIQUIDS OR SOLIDS

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

7 * 1-A	Single cable GWR probe in 316 stainless steel	For liquid level
7 * 7-A	Twin cable GWR probe in FEP coated 316 stainless steel	For liquid level
7 * 2-A	Single cable GWR probe in 316 stainless steel	For solids level (use only Viton® process seal)
7 * 5-A	Twin cable GWR probe in 316 stainless steel	For solids level (use only Viton® process seal)

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

PROCESS CONNECTION – SIZE/TYPE

Threaded

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

ANSI Flanges & EN/DIN Flanges

Refer to charts in above section.
(ANSI codes 43, 44, 45 & EN DIN codes DA, DB, DD, DE not available with 7*7/7*5 GWR probes)

PROCESS SEAL – O-RING MATERIAL

0	Viton® GFLT seal: for universal use	-40° F (-40° C) / +400° F (+200° C)

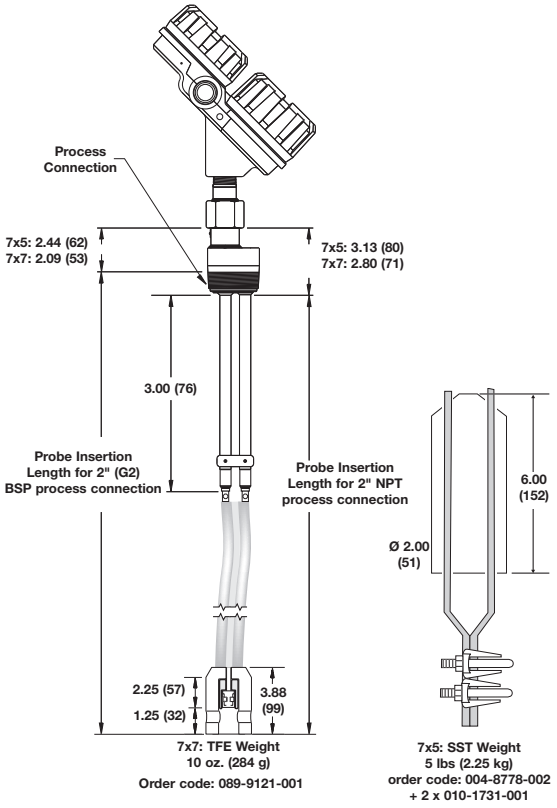
INSERTION LENGTH – Specify per 1' (1 m) increments

0 0 3	min 3' (1 m) for model 7*1
0 0 6	min 6' (2 m) for models 7*2, 7*7, 7*5
0 4 0	max 40' (12 m) for model 7*7 for liquid interface
0 7 5	max 75' (22 m) all models except 7*7 for liquid interface

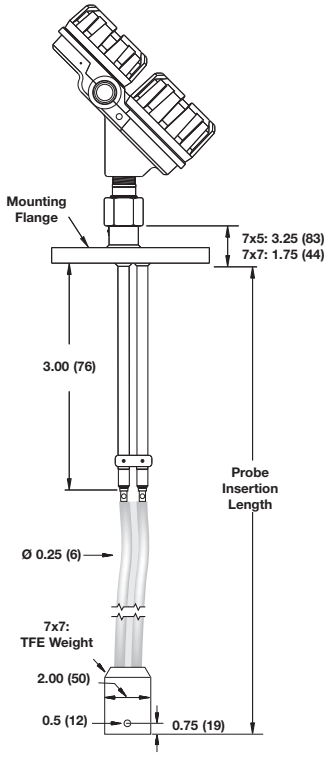
7			—	A			0	—			

PFA & FLEXIBLE PROBE DIMENSIONS

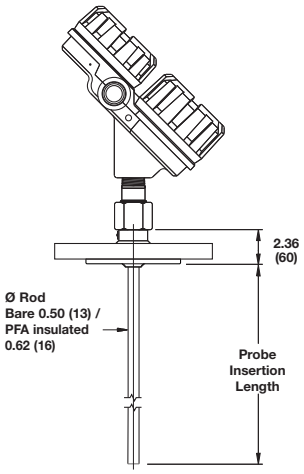
INCHES (mm)



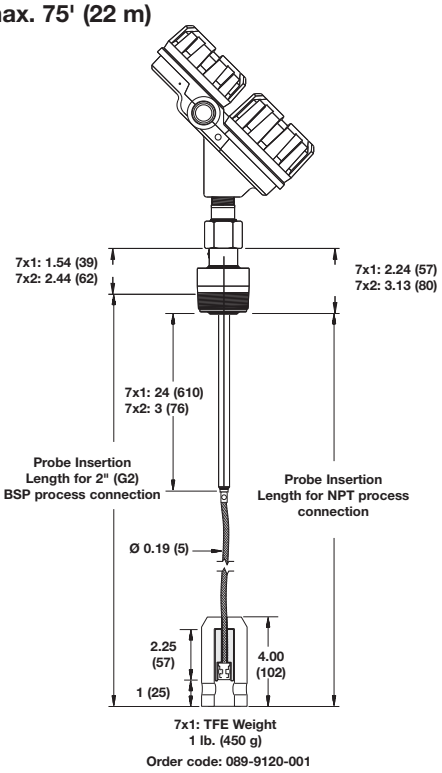
7x5/7x7
with threaded connection
max. 75' (22 m)

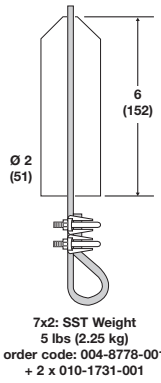


7x5/7x7
with flanged connection
max. 75' (22 m)

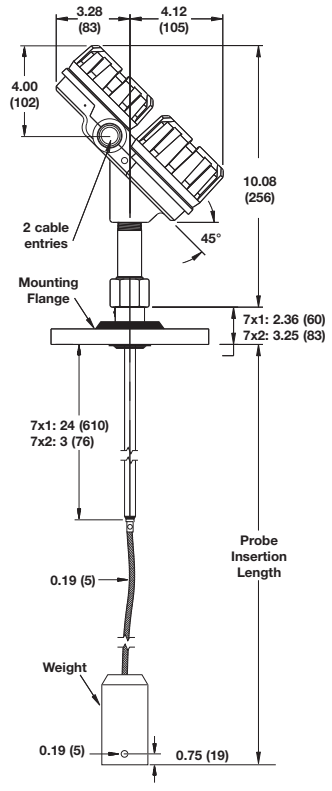


7xF-F
with PFA faced-flanged connection
max. 240" (6 m)





7x1/7x2 with threaded connection
max. 75' (22 m)



7x1/7x2 with flanged connection
max. 75' (22 m)

PFA & FLEXIBLE PROBE MOUNTING

Consult mounting considerations on page 25

QUALITY

MAGNETROL
REGISTERED TO
ISO 9001
Your Assurance of
Quality and Service

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 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 one full year 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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