Eclipse®
Enhanced Model 705
Guided Wave Radar
Level Transmitter

DESCRIPTION

The Enhanced Eclipse Model 705 is a loop-powered, 24 VDC, level transmitter based upon the revolutionary Guided Wave Radar (GWR) technology. This single transmitter can be used with all probe types and offers enhanced reliability, as demonstrated by a Safe Failure Fraction of 91%.

This Eclipse transmitter is designed to provide measurement performance well beyond that of many traditional technologies. The innovative, patented enclosure is a first in the industry orienting both wiring and electronics compartments in the same plane; and, angled to maximize ease of wiring, configuration and data display.

Eclipse supports the FDT/DTM standard and a PACT*ware*™ PC software package allows for additional configuration and trending flexibility.

TECHNOLOGY

Eclipse Guided Wave Radar is based upon the technology of TDR (Time Domain Reflectometry). TDR utilizes pulses of electromagnetic energy transmitted down a probe. When a pulse reaches a surface that has a higher dielectric than the air/vapor in which it is traveling, the pulse is reflected. An ultra high-speed timing circuit precisely measures the transit time and provides an accurate level measurement.

Eclipse GWR can be utilized to detect overall level or interface level, and when used with a HART® splitter, it can transmit two 4–20 mA signals.

APPLICATIONS

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

VESSELS: Most process or storage vessels, bridles and bypass chambers, up to rated probe temperature and pressure

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

FEATURES

- Two-wire, 24 VDC, loop-powered transmitter for level, interface, or volume
- HART or optional FOUNDATION fieldbus™ digital communications
- Performance not process dependent (changing specific gravity and dielectric constant have no significant effect)
- No level change needed for configuration; no field-calibration necessary
- 20-point custom strapping table for volumetric or flow measurement
- Ultra-low dielectric measurement capability $\varepsilon_r \geq 1.4$ (including Propane and Butane)
- Can measure reliably to very top of vessel (7xR and 7xD probes); meets TÜV: WHG § 19 overfill specifications
- Probe designs to +800° F (+427° C), 6250 psig (430 bar) and full vacuum, cryogenic applications to -320° F (-195° C)
- IS, XP, and Non-Incendive approvals
- Two-line, 8-character LCD and 3-button keypad (opt.)
- Quick connect/disconnect probe coupling
- Third Party Safety Integrity Level (SIL) data (FMEDA analysis) for Safety Instrument Systems engineering is available. HART® version is suitable for SIL 2 loops (Safe Failure Fraction, SFF = 91%)

TRANSMITTER SPECIFICATIONS

FUNCTIONAL/PHYSICAL

Signal output	4–20 mA with HART 3.8 to 20.5 mA usable (meets NAMUR NE 43) FOUNDATION fieldbus™ H1(ITK4.6) (optional)
Span	6 inches to 75 feet (15 to 2285 cm)
Resolution Analog Display	0.01 mA 0.1 inch
Loop resistance	630 Ω @ 24 VDC (20.5 mA)
Damping	Adjustable 0–10 seconds
Diagnostic alarm	Adjustable 3.6 mA, 22 mA, or HOLD
User interface	3-button keypad, HART communicator, or FOUNDATION fieldbus™
Display	2-line × 8-character LCD
Power (at terminals) General purpose/Intrinsically safe Explosion proof (with intrinsically safe probe) FOUNDATION fieldbus: General Purpose/XP Foundation fieldbus: IS/Fisco	 11 to 36 VDC 11 to 36 VDC 9 to 32 VDC 9 to 30 VDC
Menu language	English, Spanish, French and German
Housing material	Aluminum A356T6 (< 0.2% copper) 316 stainless steel (optional)
Net/Gross weight Aluminum 316 stainless steel	6 lbs (2.36 kg) / 7 lbs (2.76 kg) 13.5 lbs (5.3 kg) / 14 lbs (5.7 kg)
Overall dimensions	H 8.43" (214 mm) x W 4.38" (111 mm) × D 7.40" (188 mm)

PERFORMANCE

Reference conditions ①	Reflection from water at +70° F (+20° C) with 72" coaxial probe (CFD threshold)
Linearity ② Coaxial/Twin rod probes Single rod probes	< 0.1% of probe length or 0.1 inch (3 mm) (whichever is greater) < 0.3% of probe length or 0.3 inch (8 mm) (whichever is greater)
Measured error ② Coaxial/Twin rod probes Single rod probes Interface probes	±0.1% of probe length or ±0.1 inch (3 mm) (whichever is greater) ±0.5% probe length or ±0.5 inch (13 mm) maximum ±1 inch (25 mm)
Resolution	±0.1 inch (3 mm)
Repeatability	< 0.1 inch (3 mm)
Hysteresis	< 0.1 inch (3 mm)
Response time	< 1 second
Warm-up time	< 5 seconds
Operating temperature range LCD readable temperature range	-40° to +175° F (-40° to +80° C) -5° to +160° F (-20° to +70° C)
Operating temperature effect	±0.02% of probe length / °C
Process dielectric effect	< 0.3 inch (8 mm) of selected range
Humidity	0-99%, non-condensing
Electromagnetic compatibility	Meets CE requirements (EN 61000-6-2/2001, EN 61000-6-4/2001) (Single and Twin Rod probes must be used in metallic vessel or stillwell to maintain CE compliance)
SIL 2 (optional)	Safe Failure Fraction (SFF) 91%

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). Specification for top 48 inches of single rod will be application dependent.

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, NEMA 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, NEMA 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, NEMA 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 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 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 G T4 Class III, Type 4X
ATEX	705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe	Ⓔx II 1G D, EEx ia IIC T4
	705-5XXX-CXX 705-5XXX-DXX	Flame Proof ①	Ⓔx II 1/2G, EEx d [ia] IIC T6
	705-5XXX-EXX 705-5XXX-FXX	Non-sparking ②	Ⓔx II 3G, EEx n II T4..T6

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.**

CE 0344

These units are in conformity of:

1. The EMC Directive: 89/336/EEC. The units have been tested to EN 61000-6-2/2001 and EN 61000-6-4/2001.
2. Directive 94/9/EC for equipment or protective system for use in potentially explosive atmospheres.

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.

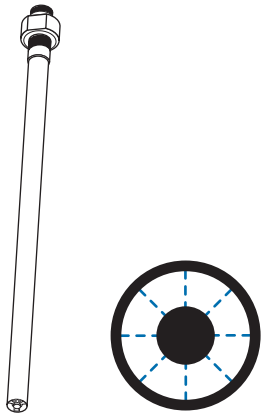


Figure 1
Coaxial Probe

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.

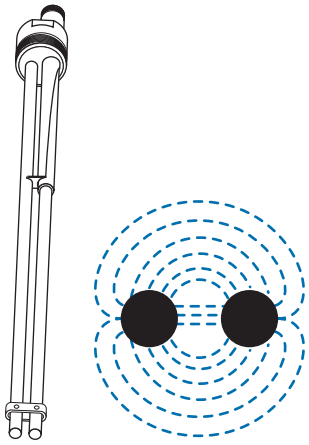


Figure 2
Twin Rod Probe

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.

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.

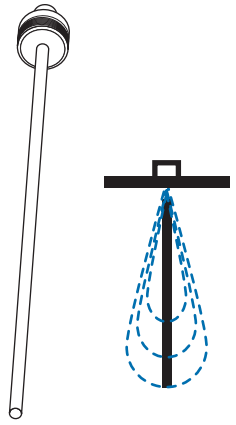


Figure 3
Single Rod Probe

NOZZLES

The 7xF/7xJ/7x1/7x2 Single Rod and 7xB/7x5/7x7 Twin Rod probes may be susceptible to objects that are in close proximity. The following rules should be followed for proper application:

7xF/7xJ/7x1/7x2 Single Rod

1. Nozzle must be 2" (50 mm) diameter (A) or larger.
2. Ratio of diameter (A) to length (B) is 1:1 or greater. Any ratio < 1:1 (e.g., a 2" × 6" nozzle = 1:3) can be used but may require a BLOCKING DISTANCE and/or SENSITIVITY adjustment. See Figure 4.
3. Pipe reducers that create restriction should not be used. See Figure 5.

7xB/7x5/7x7 Twin Rod

1. Nozzle should be 3" (80 mm) diameter or larger.

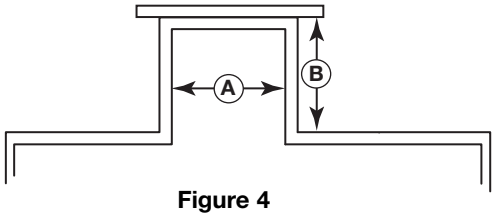


Figure 4

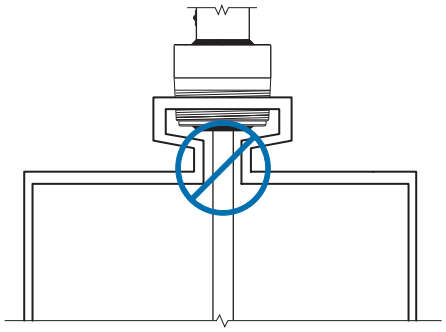


Figure 5

OBSTRUCTIONS (METALLIC)

1. Objects in proximity to the 7xF, 7x1, and 7x2 Single Rod probes can cause erroneous readings. See Figure 6.

Note: This table is only a guideline. Affect is application dependent. Consult the factory for specific details.

2. 7xB/7x5/7x7 Twin Rod probes should be installed so the active rod is > 1" (25 mm) from metallic objects such as pipes, ladders, etc. Bare tank walls parallel to the probe are acceptable.

Obstructions (Metallic) – Guidelines

Distance to probe	Acceptable objects
< 6" (150 mm)	Continuous, smooth, parallel, conductive surface (e.g. tank wall); probe should not touch tank wall
> 6" (150 mm)	< 1" (25 mm) diameter pipe and beams, ladder rungs
> 12" (300 mm)	< 3" (80 mm) diameter pipe and beams, concrete walls
> 18" (450 mm)	All remaining objects

Figure 6

TURBULENCE

The bottom of a single rod probe should be stabilized if turbulence will cause a deflection of more than 3 inches (80 mm) at 10 feet (3 m) of length. The probe should not make contact with metal. A TFE bottom spacer (P/N 89-9114-001) is optional.

INTERFACE DETECTION

The Eclipse Model 705 when used with the Model 7xT coaxial probe, is a transmitter capable of measuring both an upper liquid level and an interface liquid level. It is required that the upper liquid have a dielectric constant between 1.4 and 5, and the lower liquid have a dielectric constant greater than 15. A typical application would be oil over water, with the upper layer of oil being non-conductive with a dielectric constant of around 2, and the lower layer of water being very conductive with a dielectric constant of around 80. (This interface measurement is best accomplished when the dielectric constant of the upper medium is lower than the dielectric constant of the lower medium). See Figure 7.

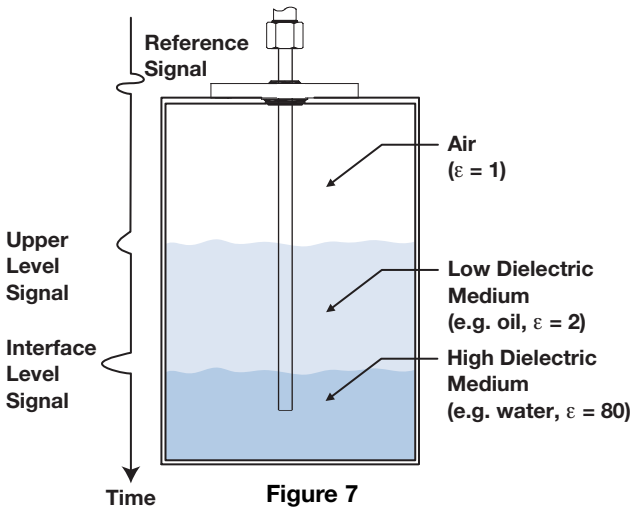


Figure 7

As mentioned earlier, 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 (dielectric constant of 1) in which it is traveling, the pulse is reflected and ultra high speed timing circuitry provides an accurate measure of liquid level. Even after the pulse is reflected from the upper surface, some of the energy continues down the length of the probe through the upper liquid. The pulse is again reflected when it reaches the higher dielectric lower liquid, as shown in Figure 7. Since the speed of the signal through the upper liquid is dependent on the dielectric constant of the medium in which it is traveling, the dielectric constant of the upper liquid must be known to accurately determine the interface level.

PROBE OVERVIEW

INTERFACE DETECTION (cont.)

Knowing the time between the first and second reflections, along with knowing the upper layer dielectric constant, the thickness of the upper layer can be determined.

In order to properly process the reflected signals, the Model 705 is specified for those applications where the thickness of the upper layer is greater than 2 inches.

EMULSION LAYERS

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

REMOTE ASSEMBLY

The Local/Remote assembly is meant to be a simple and cost-effective way to remove the transmitter electronics and locate it a short distance away from the probe. The assembly allows a remote distance of 33" (84 cm) which offers a greater degree of flexibility during installation. It is supplied with a remote bracket and flexible armor conduit as a complete assembly. Refer to Page 16 for dimensional specifications.

PACTWARE PC SOFTWARE PROGRAM

PACT***ware*** PC software and the new Field Device Tool (FDT) standard take radar level measurement to a new level of setup efficiency and user-friendliness. The powerful Eclipse guided wave radar transmitter with its linear program has always been easy to use. PACT***ware*** builds on that ease of use by adding a graphical software interface. Simply connect your PC through a serial interface to the HART loop and all functionality can be accessed quickly, conveniently, and safely.

Refer to PACT***ware*** bulletins 59-101 and 59-601 for more information.

COAXIAL PROBE MATRIX

		7xA Standard	7xD High Temperature/High Pressure
Recommended for		General purpose; clean low viscosity liquids < +300° F (+150° C)	Clean high temp/high pressure liquids > +400° F (+200° C)
Not recommended for		Coating and buildup, foam	Coating and buildup, foam, steam
Materials/Wetted parts		316L SS, TFE, Viton® GFLT	316L SS, Alumina, Borosilicate, Inconel X750
	Optional	Hastelloy® C, Monel	Hastelloy C, Monel
Process seal		Viton® GFLT O-ring ①	Borosilicate
Spacers		TFE	Alumina +800° F (+427° C) E_{min} = 2.0 PEEK +650° F (+343° C) E_{min} = 1.4 TFE +550° F (+288° C) E_{min} = 1.4
Diameter	Standard	∅ .3125" (8 mm) rod ∅ .875" (22 mm) tube	∅ .3125" (8 mm) rod ∅ .875" (22 mm) tube
	Enlarged	∅ .63" (15 mm) rod ∅ 1.75" (45 mm) tube	∅ .63" (15 mm) rod ∅ 1.75" (45 mm) tube
Process connection thread	Standard	¾" NPT, 1" BSP	¾" NPT, 1" BSP
	Enlarged	2" NPT	2" NPT
Flange ANSI (DIN)	Standard	1 to 4" (DN25 to 100)	1 to 4" (DN25 to 100)
	Enlarged	2 to 4" (DN50 to 100)	2 to 4" (DN50 to 100)
Length		24 to 240" (60 to 610 cm)	24 to 240" (60 to 610 cm)
Transition zone ②	Top	1" (25 mm) @ ε_r = 1.4 6" (150 mm) @ ε_r = 80	None
	Bottom	6" (150 mm) @ ε_r = 1.4 1" (25 mm) @ ε_r = 80	6" (150 mm) @ ε_r = 1.4 1" (25 mm) @ ε_r = 80
Process temperature ③	Maximum	+300° F @ 400 psig (+150° C @ 27 bar)	+800° F @ 2000 psig (+427° C @ 133 bar)
	Minimum/cryogenic	-40° F @ 1000 psig (-40° C @ 70 bar)	-320° F @ 2000 psig (-195° C @ 135 bar)
Process pressure	maximum	1000 psig @ +70° F (70 bar @ +20° C)	6250 psig @ +70° F (431 bar @ +20° C)
	Minimum/vacuum service	Yes, not hermetic	Yes, hermetic (< 10^{-8} cc/sec @ 1 atmos.)
Dielectric range		1.4 to 100	1.4 to 100
Maximum viscosity (cP)	Standard	500	500
	Enlarged	1500	1500
Mounting effects		None	None
Coating/Buildup		No	No
Foam		No	No
Corrosives		Yes	Yes
Sanitary		No	No
Overfill		No	Yes
Approvals	FM CSA ATEX OTHER	Yes Yes Yes No	Yes Yes Yes TÜV: WHG § 19

① Refer to Selection Chart on page 13 for optional o-rings.

② Transition Zone is dielectric dependent: ε_r = dielectric permittivity. Unit will function but accuracy will decrease in Transition Zone.

COAXIAL PROBE MATRIX

7xP High Pressure	7xR Overfill	7xS Steam	7xT Interface
Clean, high pressure liquids < +400° F (+200° C)	Overfill, temps to +400° F (+200° C); clean, low viscosity liquids	Hot water (steam) (external chamber is required for use in boiler)	Temps to +400° F (+200° C); clean, low viscosity liquids
Coating and buildup, foam, steam	Coating and buildup, foam	General purpose, coating and buildup, foam	Coating and build-up, foam
316L SS, TFE, Borosilicate, Inconel X750	316L SS, TFE, Viton® GFLT	316L SS, PEEK, Aegis PF128	316L SS, TFE, Viton® GFLT
Hastelloy C, Monel	Hastelloy C, Monel	N/A	Hastelloy C, Monel
Borosilicate	Viton® GFLT O-ring ①	Aegis PF128 O-ring, PEEK	Viton® GFLT O-ring ①
TFE	TFE	PEEK	TFE
∅ .3125" (8 mm) rod ∅ .875" (22 mm) tube	∅ .3125" (8 mm) rod ∅ .875" (22 mm) tube	∅ .3125" (8 mm) rod ∅ .875" (22 mm) tube	∅ .3125" (8 mm) rod ∅ .875" (22 mm) tube
∅ .63" (15 mm) rod ∅ 1.75" (45 mm) tube	∅ .63" (15 mm) rod ∅ 1.75" (45 mm) tube	N/A N/A	∅ .63" (15 mm) rod ∅ 1.75" (45 mm) tube
¾" NPT, 1" BSP	¾" NPT, 1" BSP	¾" NPT, 1" BSP	¾" NPT, 1" BSP
2" NPT	2" NPT	N/A	2" NPT
1 to 4" (DN25 to 100)	1 to 4" (DN25 to 100)	1 to 4" (DN25 to 100)	1 to 4" (DN25 to 100)
2 to 4" (DN50 to 100)	2 to 4" (DN50 to 100)	N/A	2 to 4" (DN50 to 100)
24 to 240" (60 to 610 cm)	24 to 240" (60 to 610 cm)⑥	24 to 180" (60 to 455 cm)	24 to 240" (60 to 610 cm)
1" (25 mm) @ ε_r = 1.4 6" (150 mm) @ ε_r = 80	None	1" (25 mm) @ $\varepsilon_r \geq 10$	None
6" (150 mm) @ ε_r = 1.4 1" (25 mm) @ ε_r = 80	6" (150 mm) @ ε_r = 1.4 1" (25 mm) @ ε_r = 80	1" (25 mm) @ $\varepsilon_r \geq 10$	6" (150 mm) @ ε_r = 1.4 1" (25 mm) @ ε_r = 80
+400° F @ 4250 psig (+200° C @ 290 bar)	+400° F @ 270 psig (+200° C @ 18 bar)	+650° F @ 2400 psig (+343° C @ 165 bar) Sat. steam	+400° F @ 270 psig (+200° C @ 18 bar)
-320° F @ 2000 psig (-195° C @ 135 bar)	-40° F @ 1000 psig (-40° C @ 70 bar)	N/A	-40° F @ 750 psig (-40° C @ 50 bar)
6250 psig @ +70° F (431 bar @ +20° C)	1000 psig @ +70° F (70 bar @ +20° C)	2400 psig @ +650° F (165 bar @ +343° C) Sat. steam	1000 psig @ +70° F (70 bar @ +20° C)
Yes, hermetic (< 10^{-8} cc/sec @ 1 atmos.)	Yes, not hermetic	Yes, not hermetic	Yes, not hermetic
1.4 to 100	1.4 to 100	10 to 100	Upper Liquid Layer 1.4 to 5 Interface Liquid Layer 15 to 100
500	500	500	500
1500	1500	N/A	1500
None	None	None	None
No	No	No	No
No	No	No	No
Yes	Yes	Yes	Yes
No	No	No	No
No	Yes	Yes	Yes
Yes Yes Yes No	Yes Yes Yes TÜV: WHG § 19 Overfill	Yes Yes Yes No	Yes Yes Yes No

③ Refer to Ambient Temperature vs. Process Temperature graph.

SINGLE ROD PROBE MATRIX

	7xF-x Standard, Bare 7xJ-x HTHP, Bare	7xF-4 Insulated	7xF-E Sanitary
Recommended for	Coating and buildup, foam	Excessive coating and buildup, foam	Applications demanding sanitary specifications
Not recommended for	Low dielectric media (ε_r < 10)④;	Low dielectric media (ε_r < 10)④;	Low dielectric media (ε_r < 10)④;
Materials/Wetted parts	316L SS, TFE, Viton® GFLT	316L SS, PFA, Viton® GFLT	316L SS, TFE, <20 R_a finish
Optional	Hastelloy C, Monel	N/A	Hastelloy C, Monel, AL6XN SS
Process Seal	7xF: Viton® GFLT O-ring ① 7xJ: Aegis PF128	Viton® GFLT O-ring ①	316L SS, TFE Viton® GFLT O-ring
Spacers	Optional TFE bottom spacer	None	None
Diameter	∅ .50" (13 mm) rod	∅ .50" (13 mm) rod ∅ .625" (16 mm) insulation	∅ .50 (13 mm) rod
Process conn. thread	2" NPT, 2" BSP	2" NPT, 2" BSP	N/A
Flange ANSI (DIN)	2 to 4" (DN50 to 100)	2 to 4" (DN50 to 100)	1.5 to 4" (38 to 100 cm); Triclover-style 16 AMP fitting
Length	24 to 240" (60 to 610 cm)	24 to 240" (60 to 610 cm)	24 to 240" (60 to 610 cm)
Transition zone ② Top	See Blocking Distance	See Blocking Distance	See Blocking Distance
Bottom	1" (25 mm) @ ε_r > 10	1" (25 mm) @ ε_r > 10	1" (25 mm) @ ε_r > 10
Blocking Distance Top	4.8 to 36" (12 to 91 cm) probe length dependent	4.8-36" (12 to 91 cm) probe length dependent	0-36" (0 to 91 cm) probe length dependent
Process temperature ③ (Maximum)	**7xF**: +300° F @ 400 psig (+150° C @ 27 bar) **7xJ**: +605° F @ 2400 psig (+316° C @ 165 bar)	+300° F @ 400 psig (+150° C @ 27 bar)	+300° F @ 75 psig (+150° C @ 5.1 bar)
Minimum (cryogenic)	-40° F @ 750 psig (-40° C @ 50 bar)	-40° F @ 750 psig (-40° C @ 50 bar)	Consult factory
Process pressure Max.	**7xF**: 1000 psig @ +70° F (70 bar @ +20° C) **7xJ**: 3000 psig @ +70° F (207 bar @ +20° C)	1000 psig @ +70° F (70 bar @ +20° C)	75 psig @ +300° F (5.1 bar @ +150° C)
Min. (vacuum service)	N/A	N/A	N/A
Dielectric range	1.9 to 100 ④	1.9 to 100 ④	1.9 to 100 ④
Maximum viscosity (cP)	10,000 (consult factory if severe agitation/turbulence)		
Mounting effects	See Nozzle and obstruction notes		
Coating/Buildup	Yes; maximum error 10% of coated length; % error related to dielectric of media, thickness of coating and coated probe length above media		
Foam	Yes	Yes	Yes
Corrosives	Yes	Yes	No
Sanitary	No	No	Yes
Overfill	No	No	No
Approvals FM	Yes	Yes	Yes
CSA	Yes	Yes	Yes
ATEX	Yes	Yes	Yes
OTHER	No	No	No

① Refer to Selection Chart on page 13 for optional o-rings.

② Transition Zone is dielectric dependent: ε_r = dielectric permittivity. Unit will function but accuracy will decrease in Transition Zone.

SINGLE ROD PROBE MATRIX

7xF-F Insulated, Faced-Flng	7x1-x Standard Flexible	7x2-x Flexible Bulk Solids Probe
Extreme corrosives, coating/buildup, foam	Coating and buildup, foam; lengths >20' (6 m) headroom	Bulk solids applications (powders, grains, dust, etc.) 3000 lb pull down force
Low dielectric media (ε_r < 10)④	Low dielectric media (ε_r < 10)④	Solids with Dielectric ε_r > 4
All PFA-wetted surfaces	316 SS, TFE, Viton® GFLT	316 SS, TFE, Viton® GFLT
N/A	N/A	N/A
PFA No O-ring	Viton® GFLT O-ring ①	Sealant
None	None	None
∅ .50" (13 mm) rod ∅ .625" (16 mm) insulation	∅ .188" (5 mm) cable	∅ .250" (6 mm) cable
N/A	2" NPT, 2" BSP	2" NPT, 2" BSP
2 to 4" (DN50 to 100)	2-4" (DN50 to 100)	2-4" (DN50 to 100)
24 to 240" (60 to 610 cm)	5 to 75 feet (1.5 to 22 meters)	5 to 75 feet (1.5 to 22 meters)
See Blocking Distance 1" (25 mm) @ ε_r > 10	See Blocking Distance 12" (305 mm)	See Blocking Distance 12" (305 mm)
4.8 to 36" (12 to 91 cm) probe length dependent	4.8 to 36" (12 to 91 cm) probe length dependent	4.8 to 36" (12 to 91 cm) probe length dependent
+300° F @ 400 psig (+150° C @ 27 bar) -40° F @ 200 psig (-40° C @ 13.7 bar)	+300° F @ 400 psig (+150° C @ 27 bar) -40° F @ 750 psig (-40° C @ 50 bar)	+150° F (+66° C) N/A
1000 psig @ +70° F (70 bar @ +20° C)	1000 psig @ +70° F (70 bar @ +20° C)	50 psig (3.4 bar)
N/A	N/A	N/A
1.9 to 100 ④	10 to 100	4 to 100
10,000 (consult factory if severe agitation/turbulence)		N/A
See nozzle and obstruction notes		
Yes; maximum error 10% of coated length; % error related to dielectric of media, thickness of coating and coated probe length above media		
Yes	Yes	Yes
Yes	No	No
No	No	No
No	No	No
Yes Yes Yes No	Yes Yes Yes No	Yes Yes Yes No

③ Refer to Ambient Temperature vs. Process Temperature graph.

④ ε_r 1.9–10 must be mounted between 2–6" (50–150 mm) of metal tank wall or in chamber/bridle.

TWIN ROD PROBE

	7xB Twin Rod-Rigid	7x7 Twin Rod-Flexible	7x5-x Flexible Light Duty Bulk Solids Probe
Recommended for	General purpose, foam, minor film coating	Low dielectric media (2.0 to 10) with lengths > 20' (6m)	Light bulk solids applications (powders, grains, dust, etc.) 3000 lb pull down force
Not recommended for	Media bridging between rods or building up on spacers	Dielectric > 10; media bridging on flexible elements	Media bridging flexible elements
Materials/Wetted parts	316L SS, TFE, Viton® GFLT	316L SS, FEP, Viton® GFLT	316L SS, TFE, Viton® GFLT
Optional	Hastelloy C, Monel	N/A	N/A
Process seal	Viton® GFLT O-ring ①	FEP with Viton® GFLT O-ring ①	Sealant
Spacers	TFE	FEP web	FEP WEB
Diameter	Two, ∅ .50 (13 mm) rod; .875" (22 mm) C_L to C_L	Two, ∅ .25" (6 mm) cables; .875" (22 mm) C_L to C_L	Two, ∅ .25" (6 mm) cables; .875" (22 mm) C_L to C_L
Process conn. thread	2" NPT, 2" BSP	2" NPT, 2" BSP	2" NPT, 2" BSP
Flange ANSI (DIN)	2 to 4" (DN50 to 100)	2 to 4" (DN50 to 100)	2 to 4" (DN50 to 100)
Length	24 to 240" (60 to 610 cm)	5 to 75' (1.5 to 22 meters)	5 to 75' (1.5 to 22 meters)
Transition zone ② Top	6" (150 mm) @ ε_r > 1.9	6" (150 mm) @ ε_r > 1.9	6" (150 mm) @ ε_r > 1.9
Bottom	6" (150 mm) @ ε_r = 1.9 1" (25 mm) @ ε_r = 80	12" (305 mm)	12" (305 mm)
Blocking Distance Top	None	4.8 to 20" (12-50 cm)	4.8 to 20" (12-50 cm)
Process temp. ③ Max.	+400° F @ 200 psig (+200° C @ 13 bar)		+150° F (+66° C)
Minimum/cryogenic	-40° F @ 1000 psig (-40° C @ 70 bar)		N/A
Process pressure Max.	1000 psig @ +70° F (70 bar @ +20° C)		50 psig (3.4 bar)
Min./vacuum service	Yes, not hermetic		N/A
Dielectric range	1.9 to 100	1.9 to 100	1.9 to 100
Maximum viscosity (cP)	1500	1500	N/A
Mounting effects ④	Active rod > 1" from any obstruction		
Coating/Buildup ⑤	Film: 3% maximum error of coated length with conductive media Bridging not recommended		
Foam	Yes	Yes	Yes
Corrosives	Yes	No	Yes
Sanitary	No	No	No
Overfill	No	No	No
Approvals FM	Yes	Yes	Yes
CSA	Yes	Yes	Yes
ATEX	Yes	Yes	Yes
OTHER	No	No	No

① Refer to Selection Chart on page 13 for optional o-rings.

② Transition Zone is dielectric dependent: ε_r = dielectric permittivity.
Unit will function but accuracy will decrease in Transition Zone.

③ Refer to Ambient Temperature vs. Process Temperature graph.

④ Minimum stillwell diameter for Twin Rod probe is 3 inch (80 mm).

⑤ Bridging is defined as continuous accumulation of material between the probe elements.

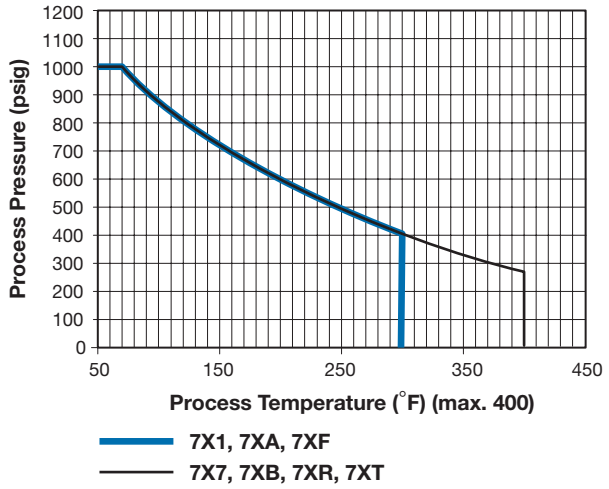
⑥ Probes shorter than 24" available. Contact factory for assistance.

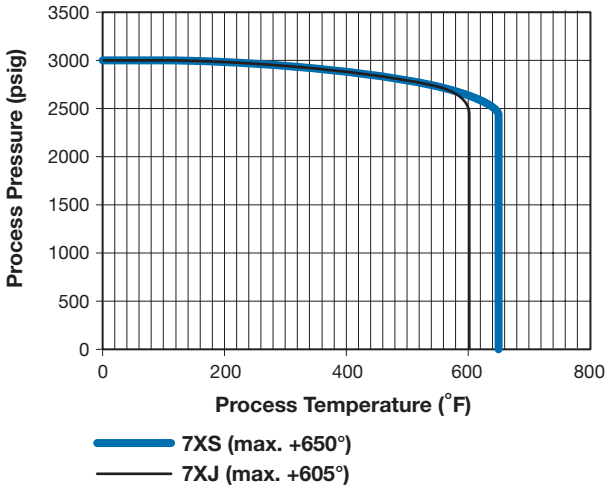
O-RING (SEAL) SELECTION CHART

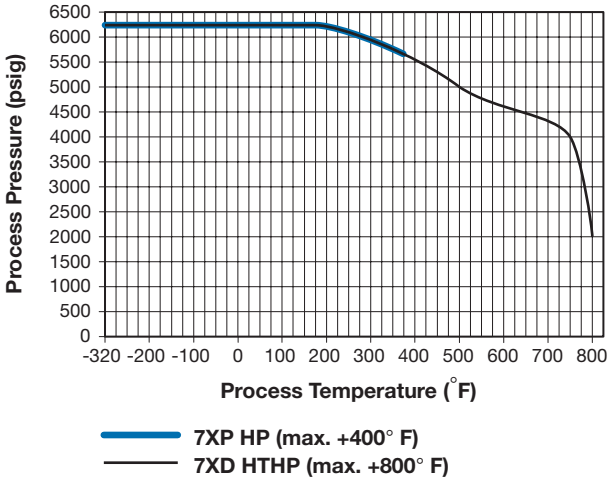
Material	Code	Maximum Temperature ①	Maximum Pressure	Min. Temp.	Recommended For Use In	Not Recommended For Use In
Viton® GFLT	0	+400° F @ 232 psig (+200° C @ 16 bar)	1000 psig @ +70° F (70 bar @ +20° C)	-40° F (-40° C)	General purpose, steam, ethylene	Ketones (MEK, acetone), skydrol fluids, amines, anhydrous ammonia, low molecular weight esters and ethers, hot hydro-fluoric or chlorosulfuric acids, sour HCs
EPDM	1	+250° F @ 200 psig (+125° C @ 14 bar)	1000 psig @ +70° F (70 bar @ +20° C)	-60° F (-50° C)	Acetone, MEK, skydrol fluids	Petroleum oils, di-ester base lubricants, propane, steam, anhydrous ammonia
Kalrez® (4079)	2	+400° F @ 232 psig (+200° C @ 16 bar)	1000 psig @ +70° F (70 bar @ +20° C)	-40° F (-40° C)	Inorganic and organic acids (including HF and nitric) aldehydes, ethylene, glycols, organic oils, silicone oils, vinegar, sour HCs	Black liquor, hot water/steam, hot aliphatic amines, ethylene oxide, propylene oxide, molten sodium, molten potassium, anhydrous ammonia
Aegis PF128	8	+400° F @ 232 psig +(200° C @ 16 bar)	1000 psig @ +70° F (70 bar @ +20° C)	-4° F (-20° C)	Inorganic and organic acids (including HF and nitric) aldehydes, ethylene, glycols, organic oils, silicone oils, vinegar, sour HCs, steam, amines, ethylene oxide, propylene oxide	Black liquor, Freon 43, Freon 75, Galden, KEL-F liquid, molten sodium, molten potassium, anhydrous ammonia
Borosilicate	N	+750° F @ 2000 psig (+400° C @ 135 bar)	5000 psig @ +70° F (345 bar @ +20° C)	-320° F (-195° C)	General high temperature/ high pressure applications, hydrocarbons, full vacuum (hermetic), anhydrous ammonia	Steam, hot alkaline solutions HF acid, media with ph>12

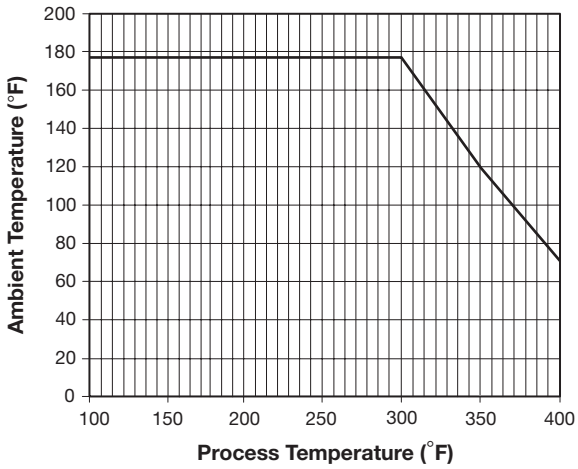
① Maximum temperature at O-ring (not necessarily maximum process temperature)

TEMPERATURE/PRESSURE CHARTS







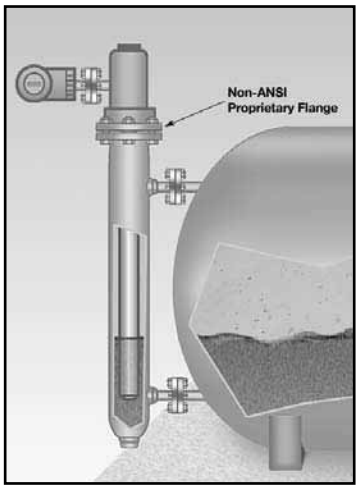


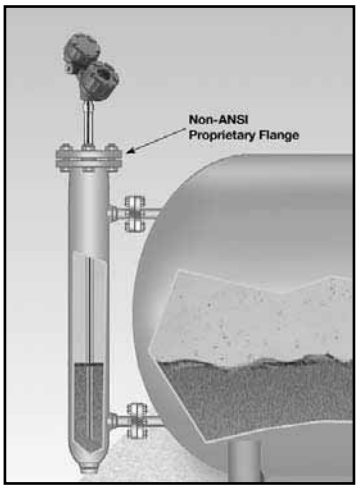
Ambient Temperature vs Process Temperature
7XA, 7XB, 7XF & 7X7

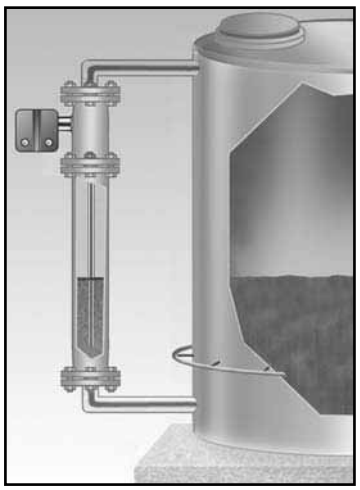
TORQUE TUBE REPLACEMENT

Eclipse has proven to be the perfect replacement for existing torque tube transmitters. In hundreds of applications around the globe, customers have found Eclipse Guided Wave Radar superior to torque tube transmitters:

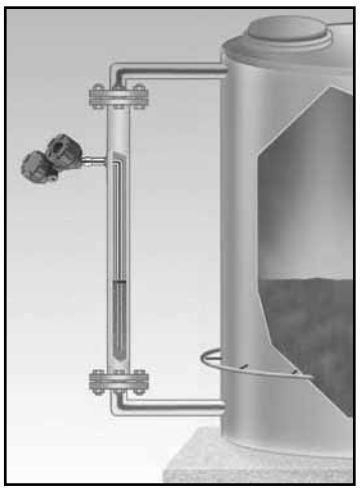
- **Cost:**
  A new Eclipse costs only slightly more than rebuilding an aging torque tube.
- **Installation:**
  No field calibration is necessary; it can be configured in minutes with no level movement.
- **Performance:**
  Eclipse is not affected by changes in specific gravity or dielectric.
- **Robust:**
  There are no moving parts to wear out and fail.
- **Ease of Replacement:**
  Proprietary flanges are offered so existing chamber/cages can be used.
- **WIB/Evaluation International (SIREP)/EXERA performance reports available**







Typical Torque Tube Transmitter in Top In/Bottom Out Configuration



Eclipse Guided Wave Radar Transmitter in Top In/Bottom Out Configuration

NOTE:

See the table below for determining the proper probe length for your installation. It is recommended to further confirm the probe length by measuring from the bottom of the transmitter flange to the bottom (internal) of the chamber.

Manufacturer	Flange Type ①② (Eclipse Digits 5, 6)	Displacer Length inches (mm)	Probe Length = (Eclipse Digits 8, 9, 10)
Fisher®: Series 2300 & 2500			
Chamber: 249B, 259B, 249C	Proprietary ①	≥ 14" (356)	Displacer + 10" (254)
Chamber: Others	ANSI	≥ 14" (356)	Consult Factory
Masoneilan®: Series 12000			
Standard	Proprietary ①	≥ 14" (356)	Displacer + 13.6" (345)③④
Others	ANSI/DIN	≥ 16" (406)	Displacer + 8" (203)
Eckardt: Series 134, 144	ANSI/DIN	≥ 14" (356)	Consult Factory
Tokyo Keiso: FST-3000 Series	ANSI/DIN	H = 11.8" (300)	Displacer + 15" (381)③
	ANSI/DIN	H = 19.7" (500)	Displacer + 9.8" (250)
Magnetrol: Modulevel® (Existing)	ANSI/DIN	14" (356)	Displacer + 12.6" (320)③④
	ANSI/DIN	≥ 17" (432)	Displacer + 7" (178)

① Proprietary (Fisher and Masoneilan) flanges are carbon steel (typical); flanges for 249C are 316 stainless steel (see digits 5 and 6 in Model Number).

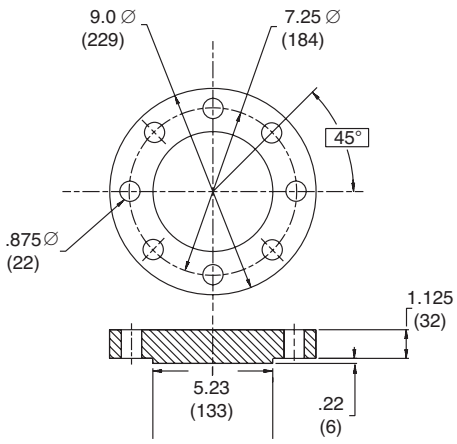
② NACE- stainless steel flanges; welded connection is acceptable, must use NPT connection for CS flanges due to hardness issues.

③ All 14" (355 mm) displacers from Masoneilan, Tokyo Keiso (H = 11.8" / 300 mm) and Magnetrol must use a "Top Hat" flange extension to meet the 24" (610) minimum probe length requirement. The flange extension adds an extra 5.5" (140 mm) to top of probe flange.

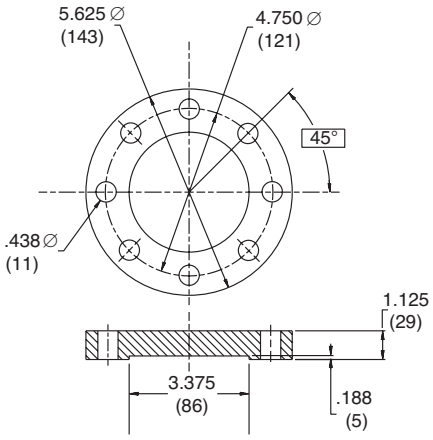
④ Round down resulting calculation to the nearest inch (mm).

Note: Due to changes in proprietary flanges over time, please confirm the proprietary flange type by comparing dimensions to the following drawings:

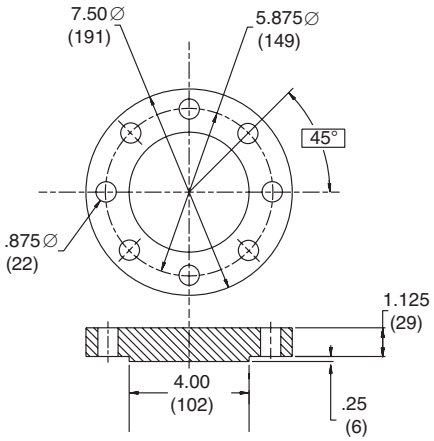
INCHES (MM)



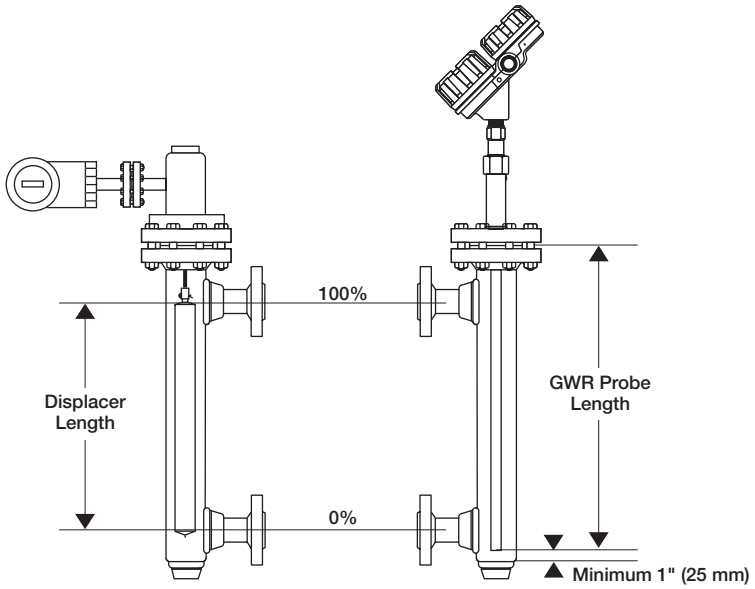
Fisher 249B/259B (600 lb.), carbon steel

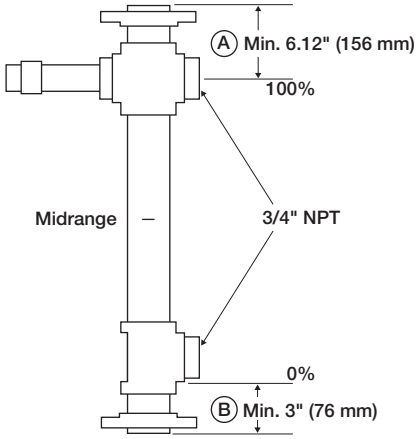


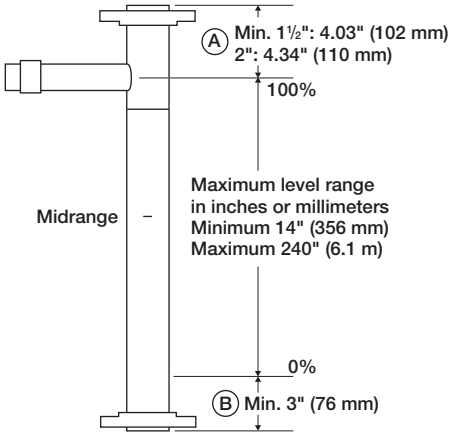
Fisher 249C (600 lb.), 316 stainless steel

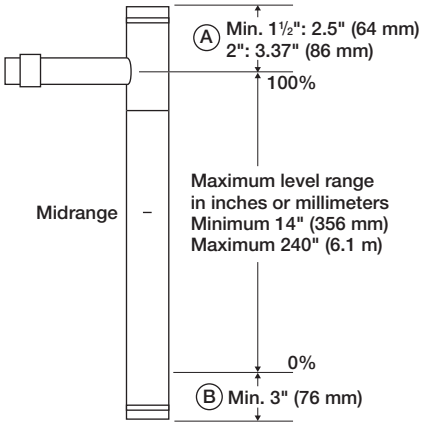


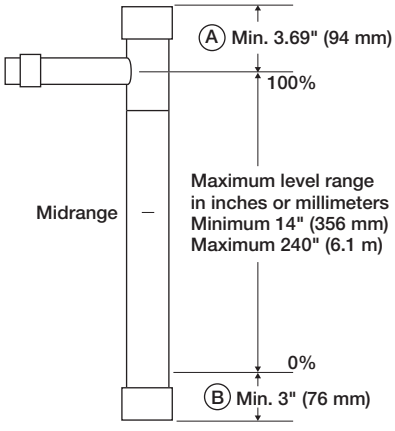
Masoneilan (600 lb.), carbon steel











Dimension A: Top of process connection up to 20 mA range
Dimension B: Bottom of process connection up to 4 mA range

CHAMBERS

If a new chamber is needed, Magnetrol offers the most complete line in the industry. The chambers are offered with all of the most popular options.

Measuring span	12 to 240 inches (30 to 610 cm)
Materials of construction	Carbon steel or 316 stainless steel
Process connection sizes	¾", 1", 1½", 2"
Process connection ratings	150#–2500# ANSI
Configurations	Side-Side, Side-Bottom, Top In-Bottom/Side Out
Process pressures	Up to 6250 psig (430 bar)
Process temperatures	Up to +800° F (+427° C)

See Sales Bulletin 41-140 and Technical Bulletin 41-640 for complete chamber information.

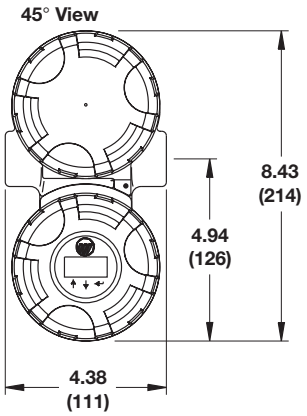
AURORA®

The next generation of Magnetic Level Indicator is here with the introduction of Aurora. Aurora is the innovative combination of a magnetic level indicator and an Eclipse Guided Wave Radar transmitter. This approach yields a highly visible local indicator with the 4–20 mA of Eclipse—a totally redundant installation. Eclipse will continue to reliably report the level even if the float becomes damaged.

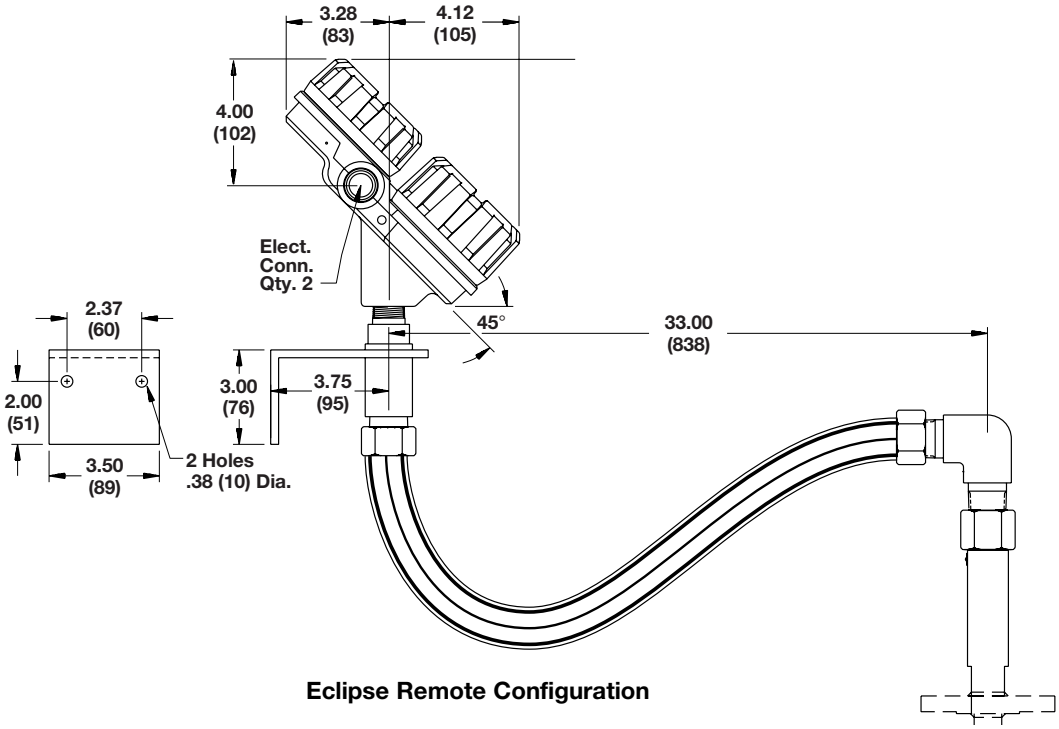
See Sales Bulletin ORI-138 for complete information.

DIMENSIONAL SPECIFICATIONS

INCHES (MM)



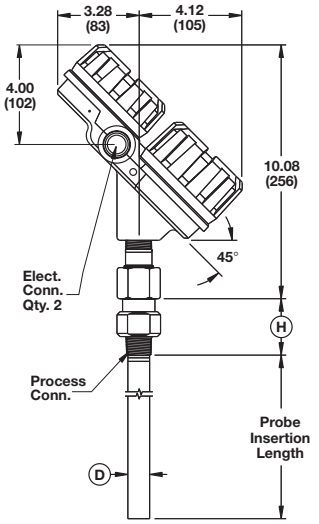
Eclipse Housing (45° View)



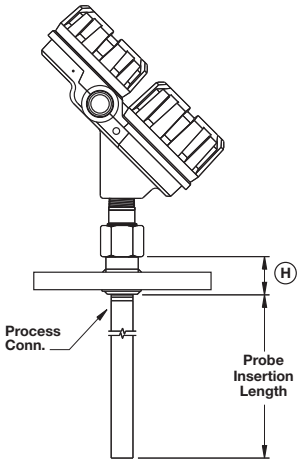
Eclipse Remote Configuration

COAXIAL PROBES

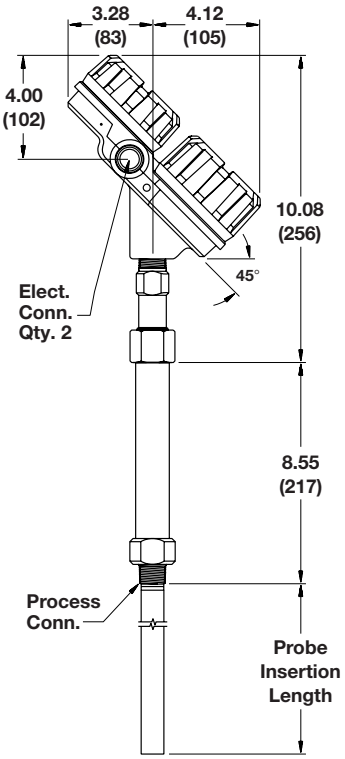
Probe	D Dimension		H Dimension	
	Standard	Enlarged	NPT	Flanged
7xA	.875 (22)	1.75 (44)	2.32 (59)	2.91 (74)
7xD	.875 (22)	1.75 (44)	8.55 (217)	10.91 (277)
7xP	.875 (22)	1.75 (44)	4.18 (106)	6.54 (166)
7xR, 7xT	.875 (22)	1.75 (44)	5.89 (150)	6.57 (167)
7xS	.875 (22)	—	7.10 (180)	9.52 (242)



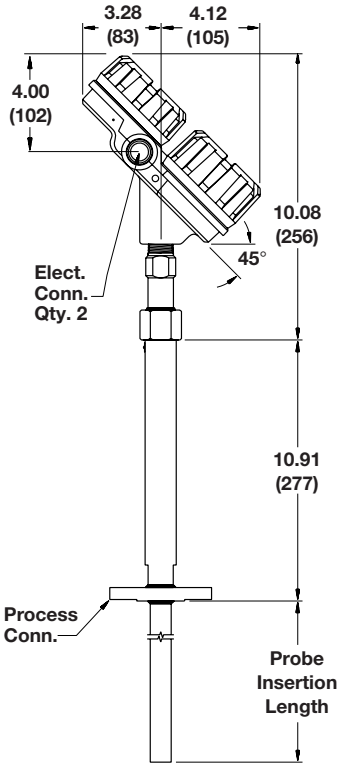
Eclipse with 7XA Probe
NPT Threaded Connection



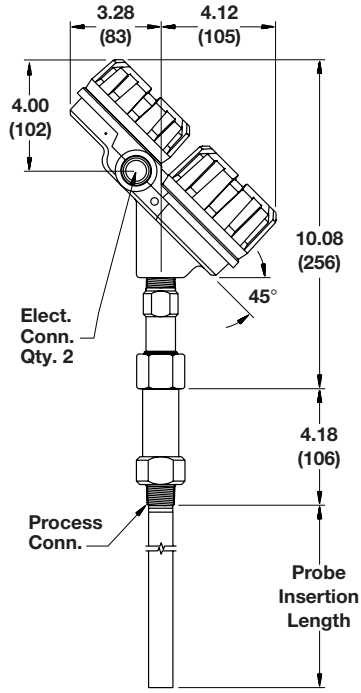
Eclipse with 7XA Probe
Flanged Connection



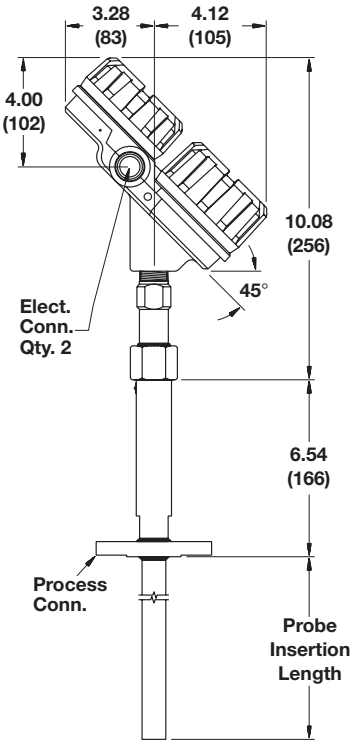
Eclipse with 7xD Probe
Threaded Connection



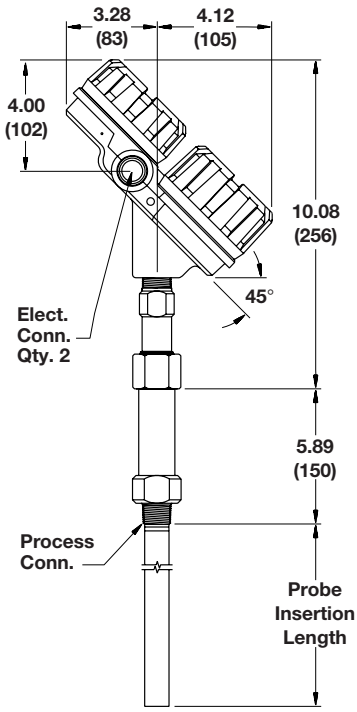
Eclipse with 7xD Probe
Flanged Connection



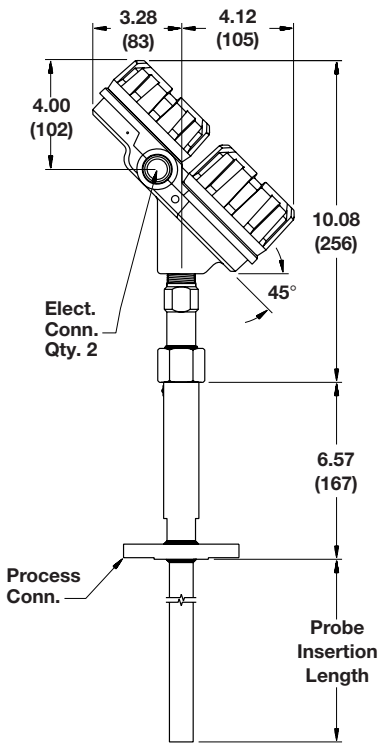
Eclipse with 7xP Probe
Threaded Connection



Eclipse with 7xP Probe
Flanged Connection



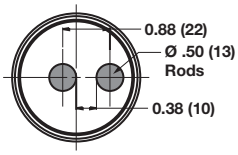
Eclipse with 7xR or 7xT Probe
Threaded Connection



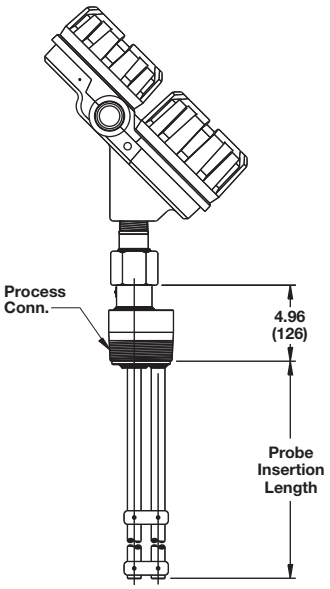
Eclipse with 7xR or 7xT Probe
Flanged Connection

DIMENSIONAL SPECIFICATIONS

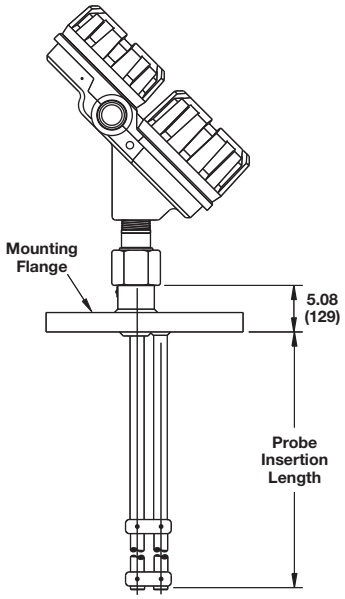
INCHES (MM) – TWIN ROD PROBES



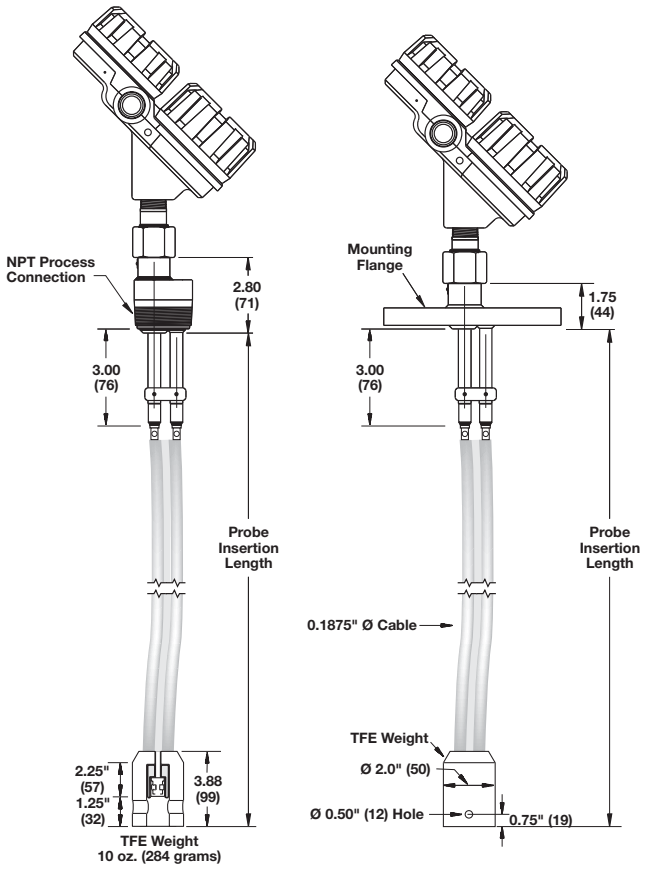
Twin Rod Probe End View



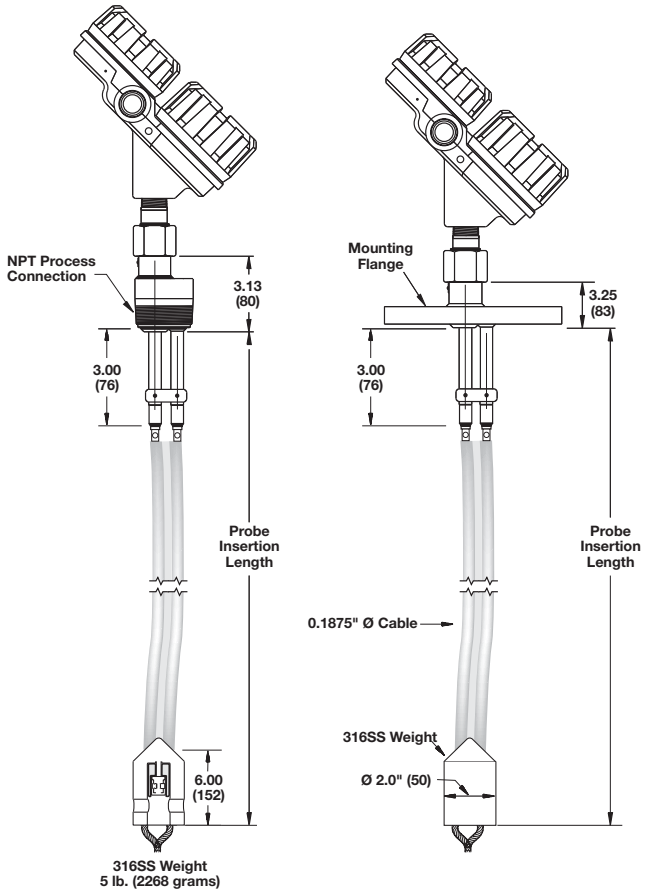
Eclipse with 7xB Twin Rod Probe – NPT Connection



Eclipse with 7xB Twin Rod Probe – Flanged Connection



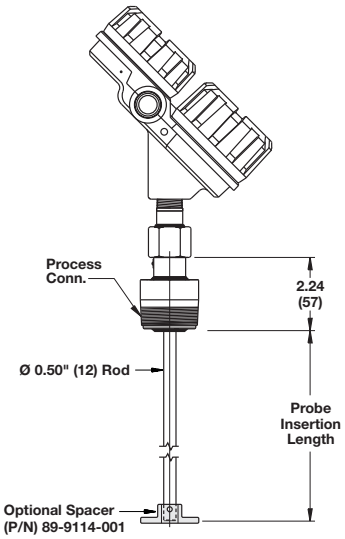
Eclipse with 7x7 Twin Rod Flexible Probe Flanged or NPT Connection



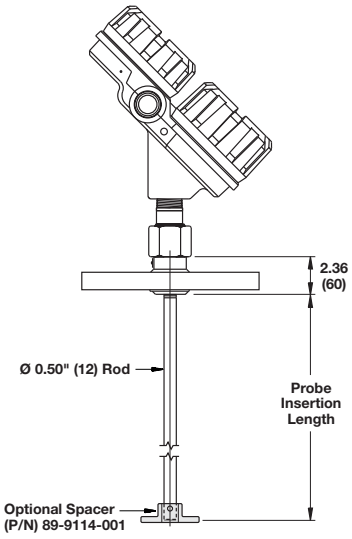
Eclipse with 7x5 Twin Rod Bulk Solids Flexible Probe Flanged or NPT Connection

DIMENSIONAL SPECIFICATIONS

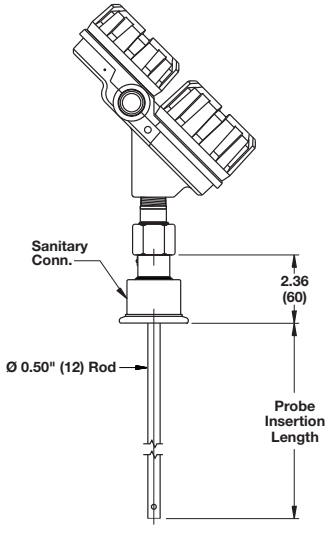
INCHES (MM) – SINGLE ROD PROBES



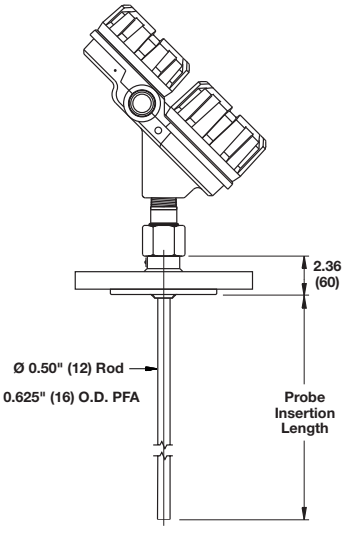
Eclipse with 7xF Probe NPT Threaded Connection



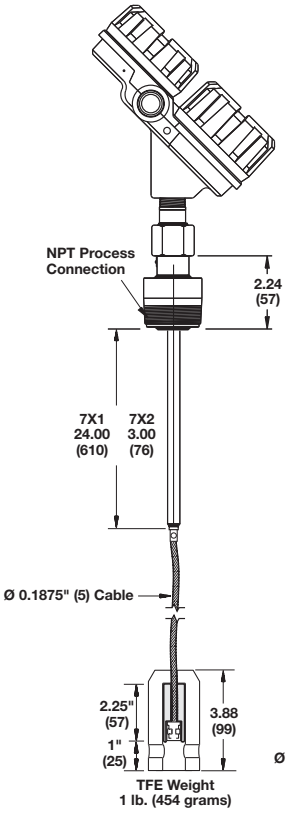
Eclipse with 7xF Probe Flanged Connection

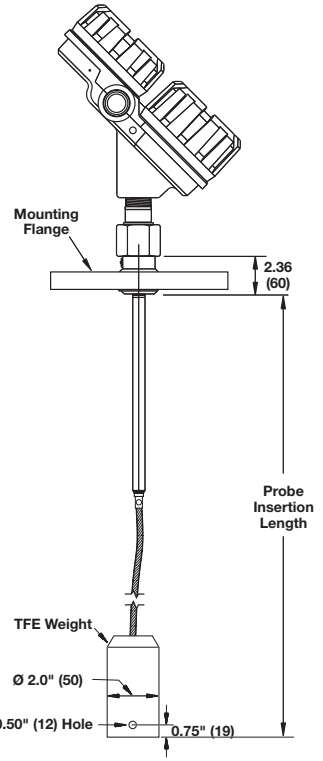


Eclipse with 7xF-E Probe Sanitary Connection

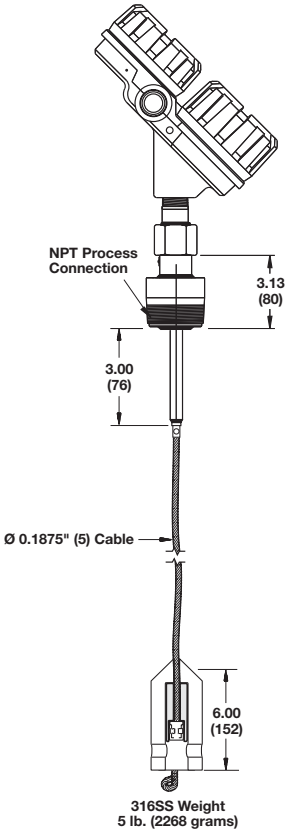


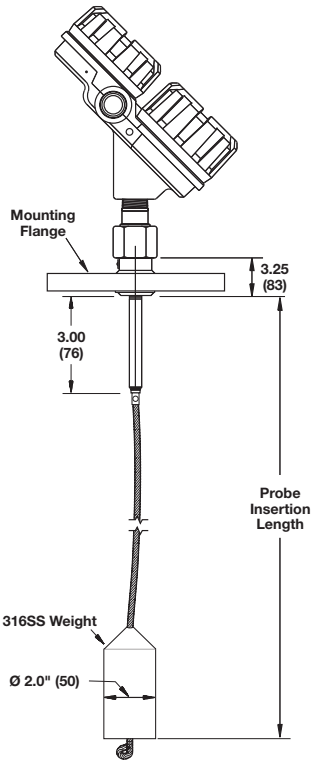
Eclipse with 7xF-F Probe Faced-Flange Connection





Eclipse with 7x1 Flexible Probe Flanged or NPT Connection





Eclipse with 7x2 Bulk Solids Flexible Probe Flanged or NPT Connection

TRANSMITTER

MODEL NUMBER

Models available for quick shipment, usually within one week after factory receipt of a 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

1	4–20 mA with HART
2	FOUNDATION fieldbus™ Digital Communication (English only)

OPTIONS

0	None – SIL 1 Approved
A	SIL 2 Approved

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] IIB 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

CONDUIT CONNECTION

0	¾" NPT
1	M20

7	0	5	—	5				—			

PROBE

MODEL NUMBER

BASIC MODEL NUMBER

7E	Eclipse GWR probe, English unit of measure
7M	Eclipse GWR probe, Metric unit of measure

CONFIGURATION/STYLE

A	Coaxial	Standard	¾" process connection or larger	Dielectric range ≥1.4
D	Coaxial	High Temp./High Pressure		
P	Coaxial	High Pressure		
R	Coaxial	Overfill		
S	Coaxial	Hot Water/Steam		
T	Coaxial	Interface		
B	Twin Rod	Standard	2" process connection or larger	Dielectric range ≥1.9
7	Twin Rod	Flexible		
5	Twin Rod	Flexible Bulk Solid		
F	Single Rod	Standard		
J	Single Rod	High Temp./High Pressure		
1	Single Rod	Flexible		
2	Single Rod	Flexible Bulk Solid		Dielectric range ≥4.0

MATERIAL OF CONSTRUCTION

A	316/316L stainless steel
B	Hastelloy C, Configuration/Style codes A, B, D, F, J, P, R and T only
C	Monel, Configuration/Style codes A, B, D, F, J, P, R and T only
E	Sanitary, 316/316L stainless steel (20 R_a finish), Configuration/Style code F only, Process connections codes 3P, 4P, 5P, and 6P only
F	PFA faced flange, 2" to 4", 150# to 300#, Configuration/Style code F only, Process connection codes 43, 44, 53, 54, 63, 64, DA, DB, EA, EB, FA, and FB only
G	Sanitary, AL6XN stainless steel (20 R_a finish), Configuration/Style code F only, Process connections codes 3P, 4P, 5P, and 6P only
H	Sanitary, Hastelloy C22, Configuration/Style code F only, Process connections codes 3P, 4P, 5P, and 6P only
K	316/316L stainless steel probe and process connection, ASME B31.1 specifications (model 7xS only)
N	Enlarged coaxial probe, 316/316L stainless steel probe, 2" minimum process connection
P	Enlarged coaxial probe, Hastelloy C, 2" minimum process connection
R	Enlarged coaxial probe, Monel probe, 2" minimum process connection
V	Optional PEEK™ spacers (for Model 7xD probe only)
W	Optional Teflon® spacers (for Model 7xD probe only)
4	PFA insulated rod, 2" NPT process connection or larger, Configuration/Style code F only

PROCESS CONNECTION SIZE/TYPE

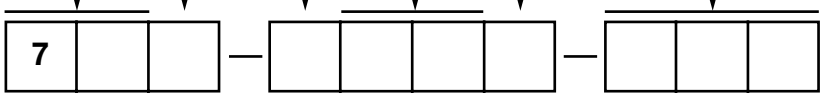
Refer to pages 22 and 23 for selections

O-RINGS

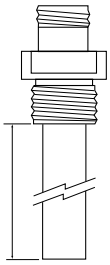
0	Viton® GFLT
1	EPDM (Ethylene Propylene Rubber)
2	Kalrez® 4079
8	Aegis PF128
N	None (Use with probes 7xD, 7xP, 7xF-E, 7xF-F)

PROBE LENGTH

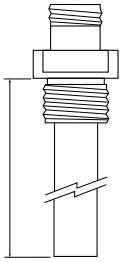
Refer to page 23 for selections



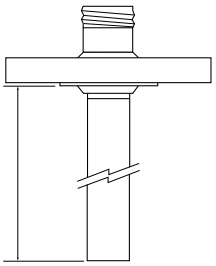
MODEL NUMBER



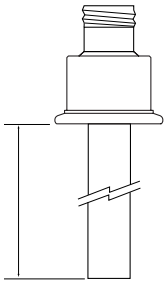
Insertion Length
NPT Process Connection



Insertion Length
BSP Process Connection



Insertion Length
ANSI or DIN Welded Flange



Insertion Length
Sanitary Flange

PROCESS CONNECTION SIZE/TYPE

THREADED CONNECTIONS

11	¾" NPT Thread ①
22	1" BSP Thread ①
41	2" NPT Thread ③
42	2" BSP Thread ③

SANITARY FLANGE CONNECTIONS

3P	1½" Triclover® type, 16 AMP Sanitary Flange
4P	2" Triclover® type, 16 AMP Sanitary Flange
5P	3" Triclover® type, 16 AMP Sanitary Flange
6P	4" Triclover® type, 16 AMP Sanitary Flange

ANSI RAISED FACE FLANGE CONNECTIONS

23	1" 150#	ANSI Raised Face Flange ①
24	1" 300#	ANSI Raised Face Flange ①
25	1" 600#	ANSI Raised Face Flange ①
27	1" 900/1500#	ANSI Raised Face Flange ②
28	1" 2500#	ANSI Raised Face Flange ②
33	1½" 150#	ANSI Raised Face Flange ①
34	1½" 300#	ANSI Raised Face Flange ①
35	1½" 600#	ANSI Raised Face Flange ①
37	1½" 900/1500#	ANSI Raised Face Flange ②
38	1½" 2500#	ANSI Raised Face Flange ②
43	2" 150#	ANSI Raised Face Flange ①
44	2" 300#	ANSI Raised Face Flange ①
45	2" 600#	ANSI Raised Face Flange ①
47	2" 900/1500#	ANSI Raised Face Flange ②

48	2" 2500#	ANSI Raised Face Flange ②
53	3" 150#	ANSI Raised Face Flange
54	3" 300#	ANSI Raised Face Flange
55	3" 600#	ANSI Raised Face Flange ①
56	3" 900#	ANSI Raised Face Flange ②
57	3" 1500#	ANSI Raised Face Flange ②
58	3" 2500#	ANSI Raised Face Flange ②
63	4" 150#	ANSI Raised Face Flange
64	4" 300#	ANSI Raised Face Flange
65	4" 600#	ANSI Raised Face Flange ①
66	4" 900#	ANSI Raised Face Flange ②
67	4" 1500#	ANSI Raised Face Flange ②
68	4" 2500#	ANSI Raised Face Flange ②

ANSI RING JOINT FLANGE CONNECTIONS

3K	1½" 600#	ANSI Ring Joint Flange ①
3M	1½" 900/1500#	ANSI Ring Joint Flange ②
3N	1½" 2500#	ANSI Ring Joint Flange ②
4K	2" 600#	ANSI Ring Joint Flange ①
4M	2" 900/1500#	ANSI Ring Joint Flange ②
4N	2" 2500#	ANSI Ring Joint Flange ②
5K	3" 600#	ANSI Ring Joint Flange ①

5L	3" 900#	ANSI Ring Joint Flange ②
5M	3" 1500#	ANSI Ring Joint Flange ②
5N	3" 2500#	ANSI Ring Joint Flange ②
6K	4" 600#	ANSI Ring Joint Flange ①
6L	4" 900#	ANSI Ring Joint Flange ②
6M	4" 1500#	ANSI Ring Joint Flange ②
6N	4" 2500#	ANSI Ring Joint Flange ②

① Configuration/Style Codes A, D, P, R, S & T only
② Configuration/Style Codes D, J, P & S only
③ Configuration/Style Codes B, F, J, 1, 2, 5 & 7 only

7			—					—			

MODEL NUMBER

PROPRIETARY AND SPECIALTY FLANGE CONNECTIONS

4R	2" 150#	ANSI Raised Face Carbon Steel Flange with Top Hat
4S	2" 300/600#	ANSI Raised Face Carbon Steel Flange with Top Hat
5R	3" 150#	ANSI Raised Face Carbon Steel Flange with Top Hat
5S	3" 300/600#	ANSI Raised Face Carbon Steel Flange with Top Hat
TT	3½" 600#	Fisher - Proprietary Carbon Steel (249B) Torque Tube Flange
TU	3½" 600#	Fisher - Proprietary 316 Stainless Steel (249C) Torque Tube Flange
UT	3½" 600#	Masoneilan - Proprietary Carbon Steel Torque Tube Flange
UU	3½" 600#	Masoneilan - Proprietary 316 Stainless Steel Torque Tube Flange
UV	3½" 600#	Masoneilan - Proprietary Carbon Steel Torque Tube Flange with Top Hat
UW	3½" 600#	Masoneilan - Proprietary 316 Stainless Steel Torque Tube Flange with Top Hat

DIN FLANGE CONNECTIONS

BA	DN 25,	PN 16	DIN 2527 Form B Flange ①
BB	DN 25,	PN 25/40	DIN 2527 Form B Flange ①
BC	DN 25,	PN 64/100	DIN 2527 Form E Flange ①
BF	DN 25,	PN 160	DIN 2527 Form E Flange ②
CA	DN 40,	PN 16	DIN 2527 Form B Flange ①
CB	DN 40,	PN 25/40	DIN 2527 Form B Flange ①
CC	DN 40,	PN 64/100	DIN 2527 Form E Flange ①
CF	DN 40,	PN 160	DIN 2527 Form E Flange ②
CG	DN 40,	PN 250	DIN 2527 Form E Flange ②
CH	DN 40,	PN 320	DIN 2527 Form E Flange ②
CJ	DN 40,	PN 400	DIN 2527 Form E Flange ②
DA	DN 50,	PN 16	DIN 2527 Form B Flange
DB	DN 50,	PN 25/40	DIN 2527 Form B Flange
DD	DN 50,	PN 64	DIN 2527 Form E Flange ①
DE	DN 50,	PN 100	DIN 2527 Form E Flange ①
DF	DN 50,	PN 160	DIN 2527 Form E Flange ②
DG	DN 50,	PN 250	DIN 2527 Form E Flange ②
DH	DN 50,	PN 320	DIN 2527 Form E Flange ②
DJ	DN 50,	PN 400	DIN 2527 Form E Flange ②

EA	DN 80,	PN 16	DIN 2527 Form B Flange
EB	DN 80,	PN 25/40	DIN 2527 Form B Flange
ED	DN 80,	PN 64	DIN 2527 Form E Flange ①
EE	DN 80,	PN 100	DIN 2527 Form E Flange ①
EF	DN 80,	PN 160	DIN 2527 Form E Flange ②
EG	DN 80,	PN 250	DIN 2527 Form E Flange ②
EH	DN 80,	PN 320	DIN 2527 Form E Flange ②
EJ	DN 80,	PN 400	DIN 2527 Form E Flange ②
FA	DN 100,	PN 16	DIN 2527 Form B Flange
FB	DN 100,	PN 25/40	DIN 2527 Form B Flange
FD	DN 100,	PN 64	DIN 2527 Form E Flange ①
FE	DN 100,	PN 100	DIN 2527 Form E Flange ①
FF	DN 100,	PN 160	DIN 2527 Form E Flange ②
FG	DN 100,	PN 250	DIN 2527 Form E Flange ②
FH	DN 100,	PN 320	DIN 2527 Form E Flange ②
FJ	DN 100,	PN 400	DIN 2527 Form E Flange ②

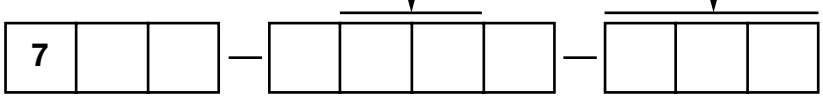
① Configuration/Style Codes A, D, P, R & S only.
② Configuration/Style Codes D & P only.

LENGTH – PROBE MODELS 7xA, 7xB, 7xD, 7xF, 7xJ, 7xP, 7xR, 7xS & 7xT

24 to 240 inches (60 to 610 cm) (7xS only: 180 inches (457 cm) maximum) (unit of measure is determined by second digit of Model Number)
Examples: 24 inches = 024; 60 centimeters = 060

LENGTH – PROBE MODEL 7x1, 7x2, 7x5 & 7x7

3 to 75 feet (1 to 22 meters) – (7x2, 7x5, 7x7: 5 feet (1.5 meters) minimum) (unit of measure is determined by second digit of Model Number)
Examples: 30 feet = 030; 10 meters = 010



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.

Magnetrol's 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. May depend on model.

Magnetrol

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Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • 01444-871313 • Fax 01444-871317

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