



# Eclipse® Enhanced Model 705 Guided Wave Radar Level Transmitter For Heavy-Duty Applications

## DESCRIPTION

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

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

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

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

## FEATURES

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

## Overfill-Safe Probes for Clean & Dirty Liquids



## APPLICATIONS

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

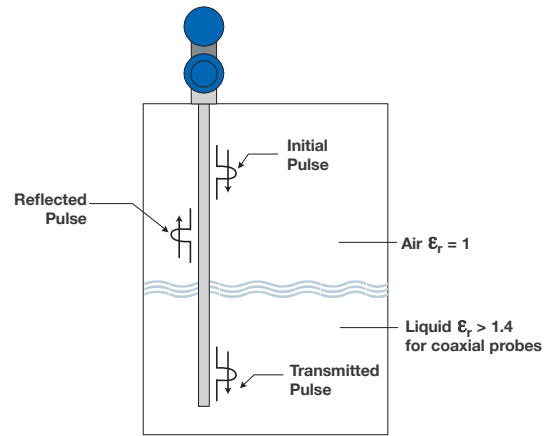
**VESSELS:** Most process or storage vessels up to rated probe temperature and pressure.

**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

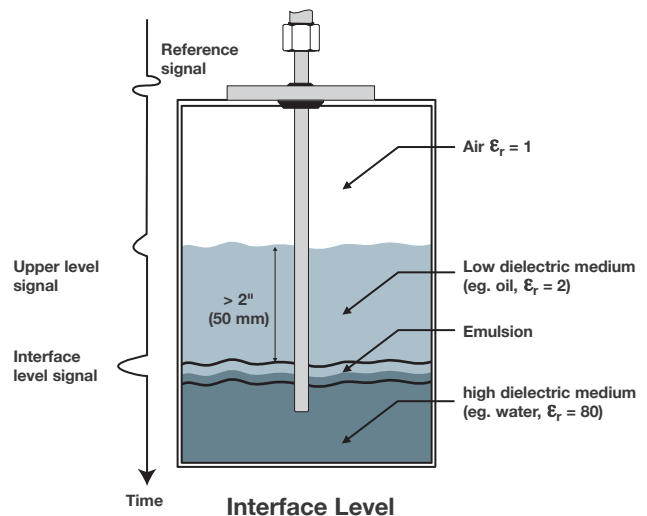
ECLIPSE Guided Wave Radar is based upon the technology of TDR (Time Domain Reflectometry). TDR utilizes pulses of electromagnetic energy transmitted down a wave guide (probe). When a pulse reaches a liquid surface that has a higher dielectric constant than the air ( $\epsilon_r$  of 1) in which it is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



Overall Level

## INTERFACE LEVEL

The ECLIPSE Model 705 is capable of measuring both an upper liquid level and an interface liquid level. Even after the pulse is reflected from the upper surface, some of the energy continues down the GWR probe through the upper liquid. The pulse is again reflected when it reaches the higher dielectric lower liquid. It is required that the upper liquid has a dielectric constant between 1.4 and 5, and the lower liquid has a dielectric constant greater than 15. A typical application would be oil over water, with the upper layer of oil being non-conductive ( $\epsilon_r \approx 2.0$ ), and the lower layer of water being very conductive ( $\epsilon_r \approx 80$ ). The thickness of the upper layer must be  $> 2"$  (50 mm). The maximum upper layer is limited to the length of a rigid GWR probe, which is available in lengths up to 20 feet (6 meters).



Interface Level

## EMULSION LAYERS

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

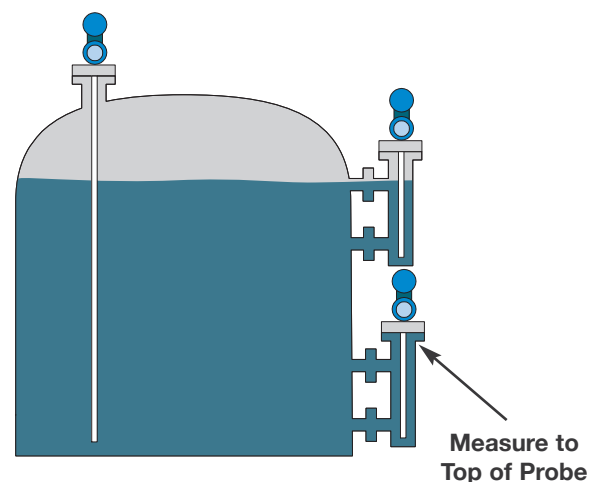
## OVERFILL SAFE

All published GWR probes in this bulletin (except 7XS) are overfill safe.

**Overfill safe** means that the characteristic impedance match of the waveguide (probe) is uniform from electronics down to the bottom of the GWR probe. This allows the ECLIPSE 705 to measure up to the process flange without any non-measurable zone at the top of the GWR probe (an area where other probes may lose the signal).

**Overfill safe** GWR probes can be installed at any location on the vessel, even when the risk of overflowing exists.

**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 a way that the vessel/cage cannot overflow.



# 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.

This bulletin focuses on coaxial probes. Refer to bulletin 57-101 for information on other types of GWR probes.

## COAXIAL PROBES

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

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

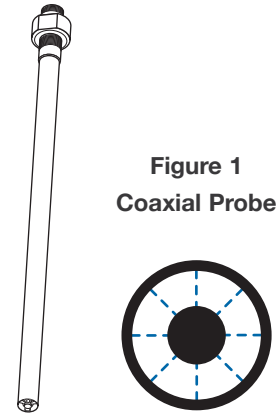


Figure 1  
Coaxial Probe

## 3 STYLES OF THE COAXIAL GWR PROBE

### Standard coaxial GWR probes for clean liquids

The standard (0.875" diameter) coaxial GWR probes are recommended for use in clean applications or special applications such as saturated steam. Spacers are located at 24-inch intervals centering the inner rod in the outer tube, obtaining a perfect characteristic impedance along the entire length of the probe. This probe can be used in applications with viscosities up to 500 cP.



where higher risk of buildup exists. The use of a single bottom spacer is recommended up to probe lengths of 10 feet. The overall performance of an enlarged coaxial GWR probe is identical to a standard coaxial GWR probe, but can be used in applications with viscosities up to 2,000 cP.

### Caged GWR probe for dirty liquids

The Caged GWR probe is a single rod probe which uses an existing or new cage, bridle or stillwell to re-create the same signal propagation of a coaxial GWR probe. Caged GWR probes are designed for 2" (DN50), 3" (DN80) or 4" (DN100) diameter chambers and utilize an impedance matching section that results in the same characteristic impedance of a coaxial style GWR probe. Caged GWR probes are overfill safe, offer the same performance of coaxial GWR probes, and can be used in applications with viscosities up to 10,000 cP.

### Enlarged coaxial GWR probes for clean liquids.

The enlarged (1.75" diameter) coaxial GWR probes can be generally used for most applications. They can be installed directly in the tank as well as into bypass cages, stillwells or bridles. The robust construction reduces the number of spacers required, allowing the probe to be used in applications

## FLUSHING CONNECTION

The maintenance of coaxial GWR probes in applications suffering from buildup, crystallization or condensation can be significantly improved by using a flushing connection. This flushing connection is a metal extension with a vent, welded above the process connection. With the vent it is possible to purge the inside of the coaxial GWR probe during routine maintenance. The best approach to defeat

the effects of condensation or crystallization is to install adequate insulation or heat tracing (steam or electrical). A flushing connection is no substitute for proper maintenance but will help to reduce/optimize the frequency of the maintenance routines.



Caged  
GWR probe



Flushing  
Connection

# TRANSMITTER SPECIFICATIONS

## FUNCTIONAL / PHYSICAL

Power (at terminals)	General Purpose / Intrinsically Safe		11 to 28.6 VDC
	Explosion Proof (with Intrinsically Safe probe)		11 to 36 VDC
	FOUNDATION fieldbus™ and PROFIBUS PA™ (FISCO)		9 to 17.5 VDC
	FOUNDATION fieldbus™ and PROFIBUS PA™ (FNICO Exd)		9 to 32 VDC
Signal Output	4-20 mA with HART®	3.8 mA to 20,5 mA useable (meets NAMUR NE 43) — HART 6	
	FOUNDATION fieldbus™	H1 (ITK Ver. 5.01) or PROFIBUS PA™ H1	
	PROFIBUS PA™		
Span			6 to 240" (150 to 6100 mm) except 7xS: max 180" (4500 mm)
Resolution			Analog: 0.01 mA Display: 0.1 cm (inch)
Loop Resistance			630 Ω @ 20.5 mA - 24 VDC
Damping			Adjustable 0-10 s
Diagnostic Alarm			Adjustable 3.6 mA, 22 mA, HOLD
User Interface			HART® communicator, AMS® or PACTware™, FOUNDATION fieldbus™, PROFIBUS PA™, and/or 3-button keypad
Display			2-line x 8-character LCD
Menu Language			English/Spanish/French/German (FOUNDATION fieldbus™ and PROFIBUS PA: English)
Housing Material			IP 66/Aluminium A356T6 (< 0.20 % copper) or 316 stainless steel
SIL ① (Safety Integrity Level)	Standard electronics	Functional safety to SIL 1 as 1oo1 / SIL 2 as 1oo2 in accordance to 61508 – SFF of 85,4 % – full FMEDA reports and declaration sheets available at request	
	Enhanced electronics	Functional safety to SIL 2 as 1oo1 in accordance to 61508 – SFF of 91 % – full FMEDA reports and declaration sheets available at request. Certified for use in SIL 3 Loops.	
Electrical Data			Ui = 28.4 V, li = 94 mA, Pi = 0.67 W Ui = 0.56 V, li = 380 mA, Pi = 5.32 W (FOUNDATION fieldbus™ / PROFIBUS PA™)
Equivalent Data			Ci = 2.2 nF, Li = 3 μH Ci = 0.24 nF, Li = 3 μH (FOUNDATION fieldbus™ / PROFIBUS PA™)
Shock/Vibration Class			ANSI/ISA-571.03 SA1 (Shock), ANSI/ISA-571.03 VC2 (Vibration)
Net and Gross Weight	Cast aluminium	6 lbs. (2.7 kg) net; 7 lbs. (3.2 kg) gross – transmitter only	
	Stainless steel	12.5 lbs. (5.7 kg) net; 13.5 lbs. (6.2 kg) gross – transmitter only	
Overall Dimensions			H 8.43" (214 mm) x W 4.38" (111 mm) x D 7.40" (188 mm)
FOUNDATION fieldbus™ specifications	ITK Version	5.01	
	H1 Device Class	Link Master (LAS) – selectable ON/OFF	
	H1 Profile Class	31PS, 32L	
	Function Blocks	1 x RB (s), 4 x AI (s), 1 x TB (c), and (1) PID	
	Quiescent current draw	15 mA	
	Execution time	15 ms (40 msec PID Block)	
CFF files			Downloads available from Host system supplier or <a href="http://www.fieldbus.org">www.fieldbus.org</a>
PROFIBUS PA specifications	Device revision	0x01	
	Digital communication protocol	Version 3.0 MBP (31.25 kbits/sec)	
	Function Blocks	1 x PB, 4 x AI blocks, 1 x TB	
	Quiescent current draw	15 mA	
	Execution time	15 ms	
GSD files			Downloads available from <a href="http://www.profibus.com">www.profibus.com</a> or <a href="http://Magnetrol.com">Magnetrol.com</a>

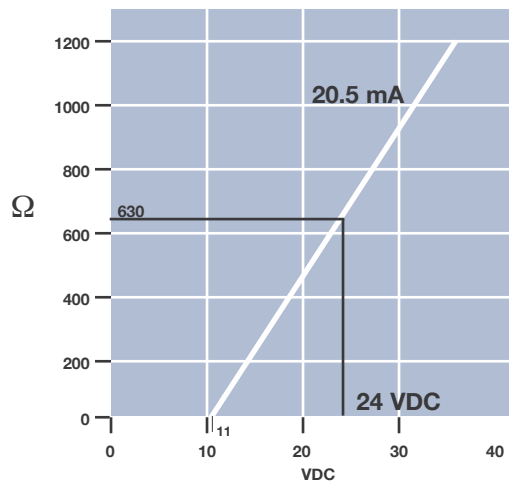
① Not applicable for FOUNDATION fieldbus™ and PROFIBUS PA™ units.

# 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 ②③	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)

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



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

# PROBE SPECIFICATIONS

Description		7xT/7xN: Level/Interface GWR Probe
Materials	Probe	316/316L (1.4401/1.4404) Hastelloy C® (2.4819) or Monel® (2.4360)
	Process seal	TFE with Viton® GFLT or Kalrez 4079 (Consult factory for alternatives)
	Spacers	Teflon
Probe diameter	Enlarged coax	<b>Stainless steel:</b> Inner rod 0.63" (16 mm) – Outer tube 1.75" (45 mm) <b>Hastelloy C and Monel:</b> Inner rod 0.63" (16 mm) – Outer tube 1.92" (49 mm)
Mounting		In-tank mounting / external cage mounting – overfill safe
Process Connection		<b>Threaded:</b> ¾" NPT or 1" BSP (G1) – except for enlarged probe, 2" NPT <b>Flanged:</b> 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	0" (0 mm)
	Bottom	$\epsilon_r$ : 1.4 = 6" (150 mm)/ $\epsilon_r$ : 80 = 2" (50 mm)
Process Temp.	Max	+400° F @ 270 psi (+200° C @ 18 bar)
	Min	-40° F @ 750 psi (-40° C @ 50 bar)
Max. Process Pressure ③		1000 psi @ +70° F (70 bar @ +20° C)
Max. Viscosity		500 cP (standard) 2000 cP (enlarged)
Dielectric Range		Upper liquid: $\geq 1.4$ and $\leq 5$ Lower liquid: $\geq 15$
Vacuum service		Negative pressure but not hermetic seal
Media coating		In case of media coating, select 7xN probe

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

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

③ See tables on page 10.

Description		7xG: Level/Interface Caged GWR Single Rod
Materials	Probe	316/316L (1.4401/1.4404), Monel® (2.4360), Hastelloy C® (2.4819) or
	Process seal	TFE with Viton® GFLT or Kalrez 4079 (Consult factory for alternatives)
Probe diameter	2" chamber	½" (13 mm) Rod
	3" chamber	¾" (19 mm) Rod
	4" chamber	1" (25 mm) Rod
Mounting		External 2", 3", or 4" cage mounting — overfill safe
Process Connection		Flanged: Various ANSI or EN/DIN
Probe length		From 24 to 240 inches (600 to 6100 mm)
Blocking distance (top)		0"
Transition Zone ① (bottom)		$\epsilon_r$ : 1.4 = 6" (150 mm)/ $\epsilon_r$ : 80 = 2" (50 mm)
Process Temp. ②	Max	+400° F @ 270 psi (+200° C @ 18 bar) ambient
	Min	-40° F @ 750 psi (-40° C @ 50 bar)
Max Process Pressure		1000 psi @ +70° F (70 bar @ +20° C)
Max Viscosity		10.000 cP – consult factory in case of agitation/turbulence
Dielectric Range		1.4 to 100
Media coating		Maximum error 10% of coated length. % Error is related to dielectric of medium, thickness of coating and coated probe length above level.
Vacuum Service		Negative pressure; but not hermetic seal

① Transition Zone (zone with reduced accuracy) is dielectric dependent;  $\epsilon_r$  = dielectric permittivity. It is recommended to set 4-20 mA signal outside transition zones.

② See tables on page 10.

# PROBE SPECIFICATIONS

Description		7xD/7xL: High Pressure / High Temperature GWR probe	7xQ/7xS: Saturated Steam GWR Probe
Materials	Probe	316/316L (1.4401/1.4404), Hastelloy C® (2.4819) or Monel® (2.4360)	
	Process seal	Borosilicate/Inconel X750	High Temp PEEK with Aegis PF 128 Alumina (7xQ only)
	Spacers	High Temp PEEK (7xD-V, N, P and R) – Alumina (7xD-A, B and C) – TFE (7xD-W)	High Temp PEEK (7xS) Alumina (7xQ)
Probe diameter	Standard coax	n/a	Inner rod 0.31" (8 mm) Outer tube 0.87" (22.5 mm) (7xS) Outer tube 1.25" (31.75 mm) (7xQ)
	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, 2" NPT Flanged: Various ANSI, DIN or “proprietary” mating flanges	Threaded: ¾" NPT or 1" BSP (G1) (not available with 7xQ) Flanged: Various ANSI, DIN or “proprietary” mating flanges
Probe length		From 24 to 240" (60 to 610 cm) ①	From 24 to 180" (60 to 450 cm)
Transition Zone ②	Top	0" (0 mm)	8" (200 mm) ③
	Bottom	$\epsilon_r$ : 1.4 = 6" (150 mm) / $\epsilon_r$ : 80 = 1" (25 mm)	$\epsilon_r \geq 10 = 1" (25 mm)$
Max. Process Temp.	Max	+800° F @ 1500 psi (+430° C @ 103 bar) +650° F @ 4700 psi (+345° C @ 324 bar) for 7xx-V, N, P and R +550° F @ 5700 psi (+288° C @ 393 bar) for 7xx-W	+575° F @ 1275 psi (+300° C @ 88 bar) (7xS) +650° F @ 2250 psi (+345° C @ 155 bar) (7xQ)
	Min	-320° F @ 2000 psi (-196° C @ 135 bar)	0° F @ 3000 psi (-15° C @ 205 bar)
Max. Process Pressure ④		6250 psi @ +70° F (430 bar @ +20° C)	1275 psi @ +575° F (88 bar @ +300° C) (7xS) 2250 psi @ +650° F (155 bar @ +345° C) (7xQ)
Max. Viscosity		500 cP (standard) / 2000 cP (enlarged)	500 cP
Dielectric Range		$\epsilon_r \geq 1.4$ -100: 7xx-W, V, N, P and R $\epsilon_r \geq 2,0$ -100: 7xx-A, B and C	10 to 100
Vacuum service		Full vacuum (Helium leak < 10 <sup>-8</sup> 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;  $\epsilon_r$  = dielectric permittivity. It is recommended to set 4–20 mA signal outside transition zones.

③ Consult factory for overflow applications.

④ See tables on page 10.

Description		7EK: Top/Bottom GWR probe min $\epsilon_r$ 1.4 - max +500° F (+260° C)	7EK: Top/Bottom GWR probe min $\epsilon_r$ 10 - max +605° F (+320° C)
Materials	Probe	316/316L (1.4401/1.4404)	
	Process seal	PEEK and TFE with Aegis PF 128	PEEK and Alumina with Aegis PF 128
	Bottom spacer	TFE	PEEK
Probe diameter		Inside tube: max 0.875" (22 mm)	
Cage		2" – Sch 80 Top/Bottom cage	
Process Connection		Threaded: 1½" NPT or 2" NPT Welded: 2" socket weld Flanged: Various ANSI, DIN or “proprietary” mating flanges	
Measuring range		min 14" (356 mm) Std. – max 240" (6.1 m)	
Process Temp.	Max	+500° F @ 1700 psi (+260° C @ 120 bar)	+605° F @ 1585 psi (+320° C @ 110 bar)
	Min	0° F @ 3000 psi (-15° C @ 205 bar)	
Max. Process Pressure		1700 psi @ 0° F (120 bar @ -15° C)	
Max. Viscosity		10.000 cP	
Dielectric Range		1.4 to 100 - Non-conductive and conductive media	10 to 100 - Conductive media
Vacuum service		Negative pressure but not hermetic seal	

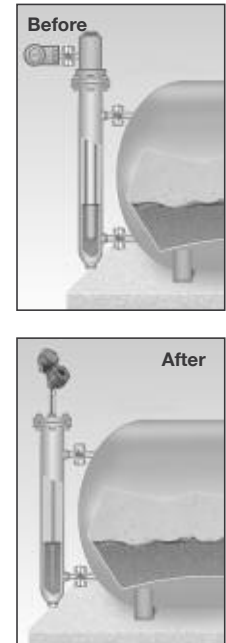
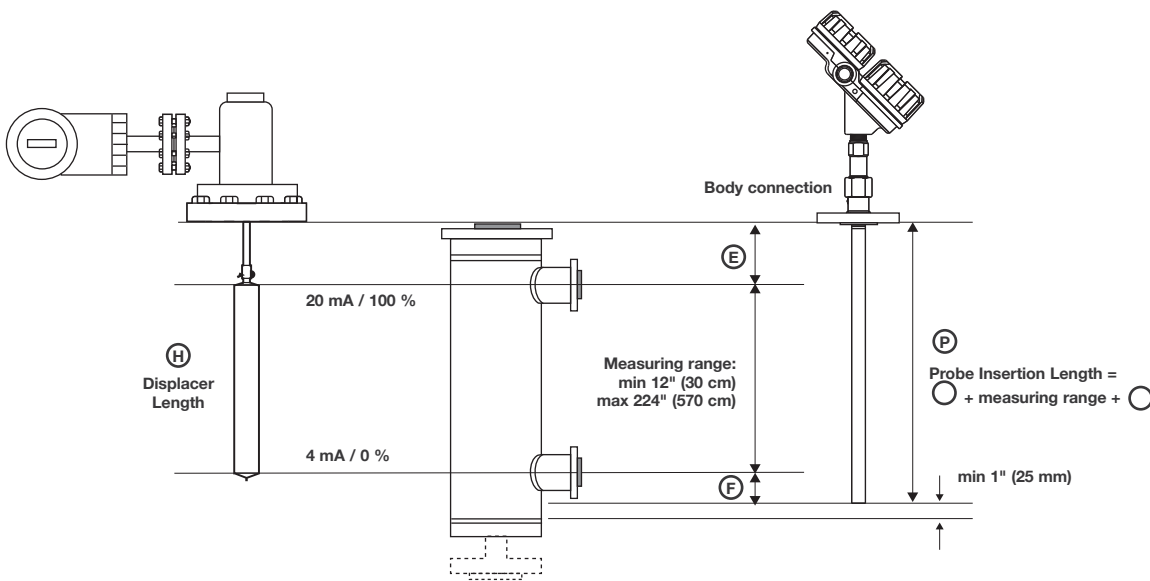
# REPLACEMENT OF DISPLACER TRANSMITTER

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

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

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

- **Type of application:**  
Use the applicable GWR probe, see pages 14–23.
- **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"



## Recommended probe length for replacing displacer transmitters

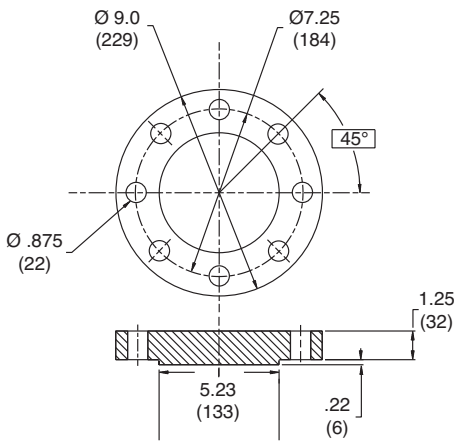
The table below helps to define the GWR probe length for the most common displacer transmitters. Refer to the flange selection guide on the next page.

Manufacturer	Type	Process connection	Displacer length inches (mm)	Probe length <sup>①</sup> inches (mm)
Magnetrol®	EZ & PN Modulelevel®	ANSI/DIN flange	≥ 14" (356)	Displacer + 7 (178)
Masoneilan®	Series 1200	Proprietary flange	≥ 14" (356)	Displacer + 8 (203)
		ANSI/DIN flange	≥ 16" (406)	Displacer + 8 (203)
Fisher® series 2300 & 2500	249B, 259B, 249C cages	Proprietary flange	≥ 14" (356)	Displacer + 10 (254)
	other cages	ANSI flange	≥ 14" (356)	consult factory
Eckardt®	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)

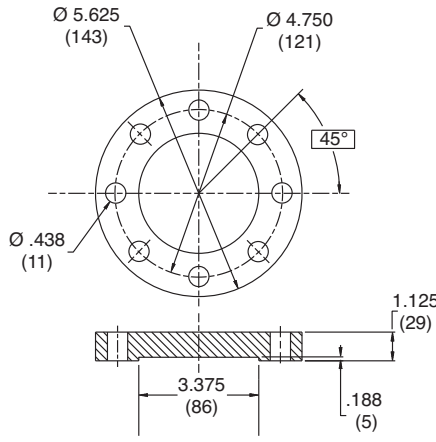
① Round down resulting calculation to the nearest inch.



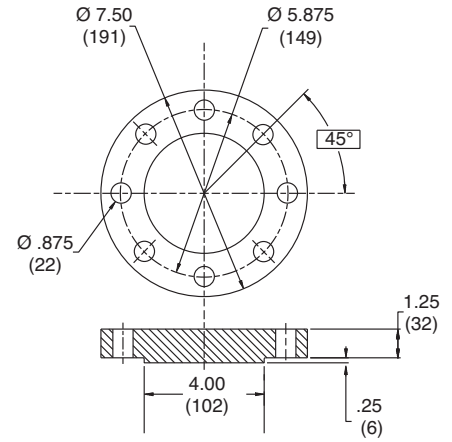
# PROPRIETARY FLANGES



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



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



Masoneilan (600 lb.), carbon steel

Figure 1

Figure 2

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 41-140.



## AURORA®



The Orion Instruments® Aurora® is the innovative combination of the ECLIPSE Guided Wave Radar transmitter and a Magnetic Level Indicator (MLI). The integration of these two independent technologies provides excellent redundancy. The float positioned within the AURORA chamber moves up and down according to level changes. The float contains an internal group of magnets that are "coupled" with magnets in the flags of the visual indicator. As the float moves, the flags rotate to expose the color of their opposite side. The position where the flag's color changes corresponds to a point on the measuring scale indicating true level. The ECLIPSE transmitter continuously emits electromagnetic radar pulses directly off the liquid surface, and provides a real-time level output, in addition to the external visual indicator operated by the AURORA internal float.

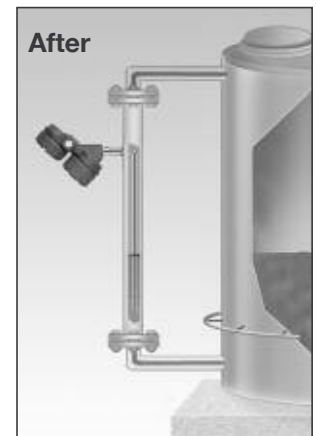


For more details, refer to bulletin ORI-101.

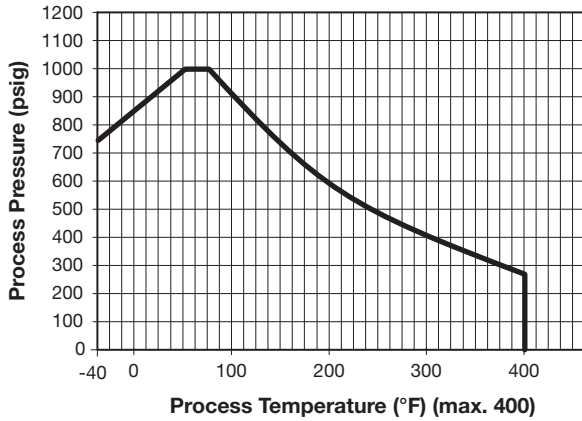
## REPLACEMENT OF TOP/BOTTOM CAGES

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

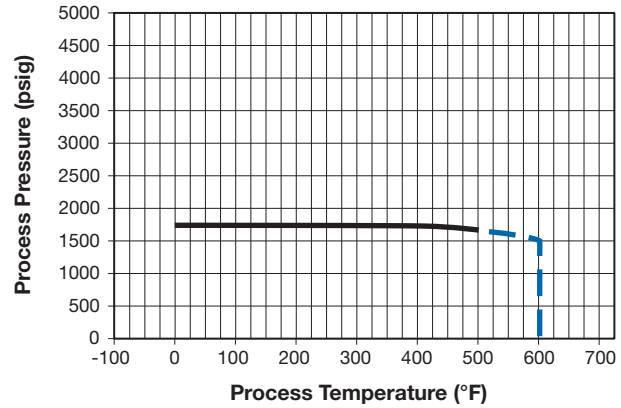
After removal of the existing torque tube cage assembly (controller, displacer and cage), ECLIPSE Guided Wave Radar may then be installed directly in its place. Several models are available for some of the major torque tube displacer transmitter manufacturers. Because the Model 7EK probe/cage mounting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



# TEMPERATURE - PRESSURE RATING FOR ECLIPSE® PROBE SEALS

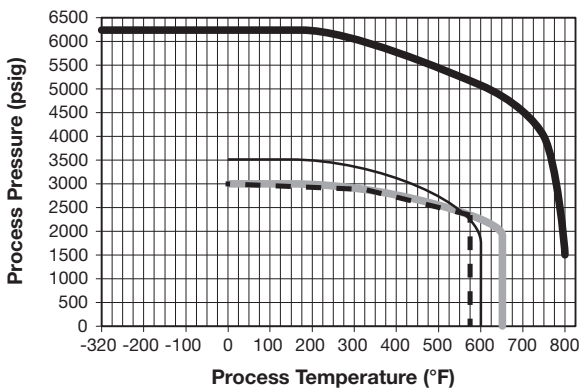


— 7XG, 7XT, 7XL, 7XN



— 7EK top/bottom GWR probe: max +500° F for conductive and non conductive liquids

- - - 7EK top/bottom GWR probe: max +600° F for conductive liquids only



— 7XD, 7XL HTHP (max. +800° F)  
 - - - 7XS (max. +575° F)  
 — 7XJ (max. +605° F)  
 — 7XQ (max. +650° F)

## PACTware™ PC SOFTWARE

FDT technology provides an open communication interface between field instruments of various communication protocols and the host/DCS system. The DTM driver is typically designed for one type of instrument and delivers the full functionality of the device, along with a graphical user interface, via a laptop or PC. MAGNETROL transmitters use the free shareware PACTware™ software to support DTM drivers and the FDT functionality. With PACTware™ it becomes easy to configure, monitor and diagnose a MAGNETROL transmitter remotely or even to call for support using screenshots of echo curves and trending graphs. The MAGNETROL HART® DTM library has passed the dtmINSPECTOR, which is the official FDT interoperability test and certification tool. MAGNETROL DTMs are free of charge and can be downloaded from [www.magnetrol.com/products/software/PACTware™](http://www.magnetrol.com/products/software/PACTware™) or obtained via CD-Rom from your nearest MAGNETROL contact.



PACTware™ CD with DTM drivers



Magnetrol® recommends the VIATOR® USB HART® Interface from MACTek® Corporation.



# AGENCY APPROVALS

AGENCY	MODEL APPROVED	APPROVAL CATEGORY	APPROVAL CLASSES
	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
		705-5XXX-1XX 705-5XXX-2XX	Intrinsically Safe
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
		705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe ③
		705-5XXX-AXX 705-5XXX-BXX	Intrinsically Safe ③
705-5XXX-CXX 705-5XXX-DXX		Flame Proof	Ⓜ II 1/2G, EEx d [ia] IIC T6
705-51XX-EXX 705-51XX-FXX 705-52XX-EXX 705-52XX-FXX		Non-sparking	Ⓜ II 3(1)G, EEx nA [ia] IIC T4..T6 with probe II 1 G EEx ia IIC T6 Ⓜ II 3(1)G, EEx nA [nL] [ia] IIC T4..T6 with probe II 1 G EEx ia IIC T6



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
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### POWER

5	24 VDC, Two-wire
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### SIGNAL OUTPUT AND ELECTRONICS

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

### ACCESSORIES

0	No digital display and keypad
A	Digital display and keypad

### MOUNTING/CLASSIFICATION

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

### HOUSING

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

### CONDUIT CONNECTION

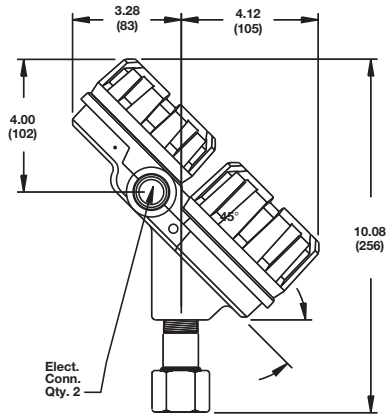
0	¾" NPT
1	M20

- ① Not available with Model 7xQ steam probe.
- ② To reduce the possibility of probe damage due to vibration, it is recommended to use a remote mount transmitter (Mounting/Classification codes 2, 4, B, D or F) when ordering the heavier 316 SS version.

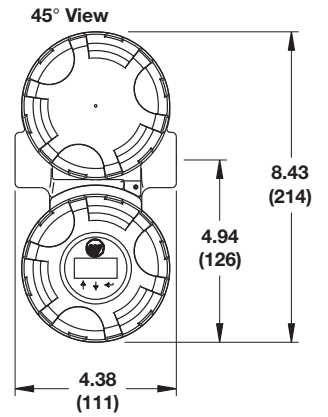


# DIMENSIONS

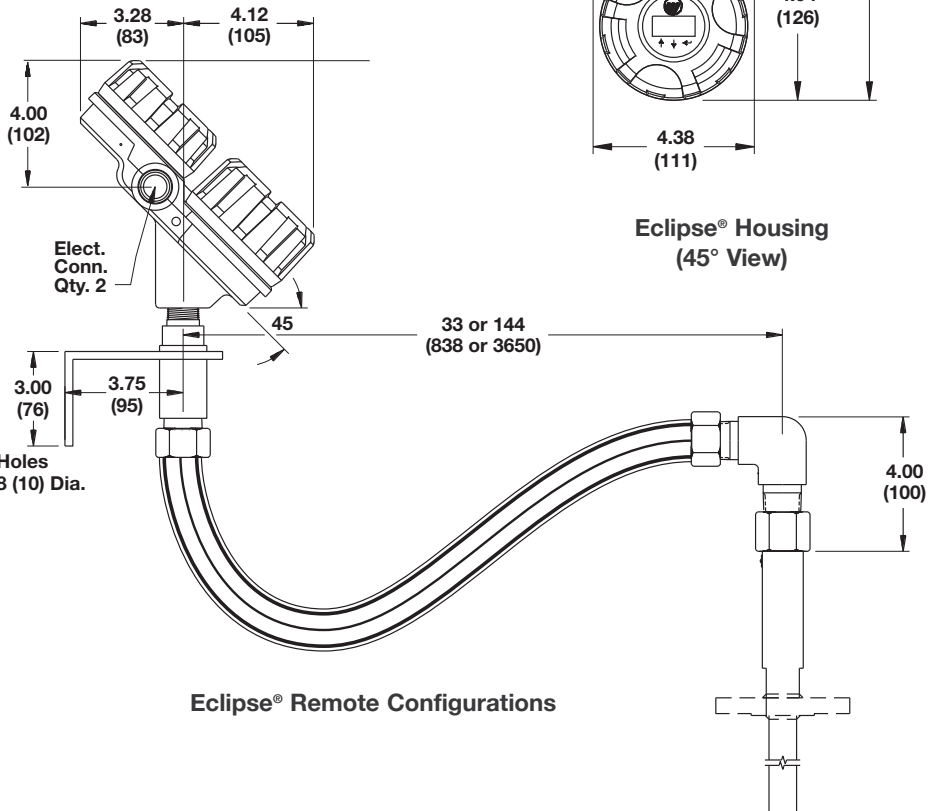
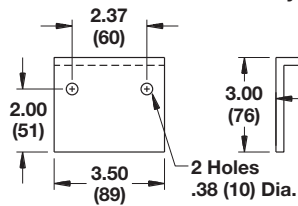
inches (mm)



**Integral Electronics**

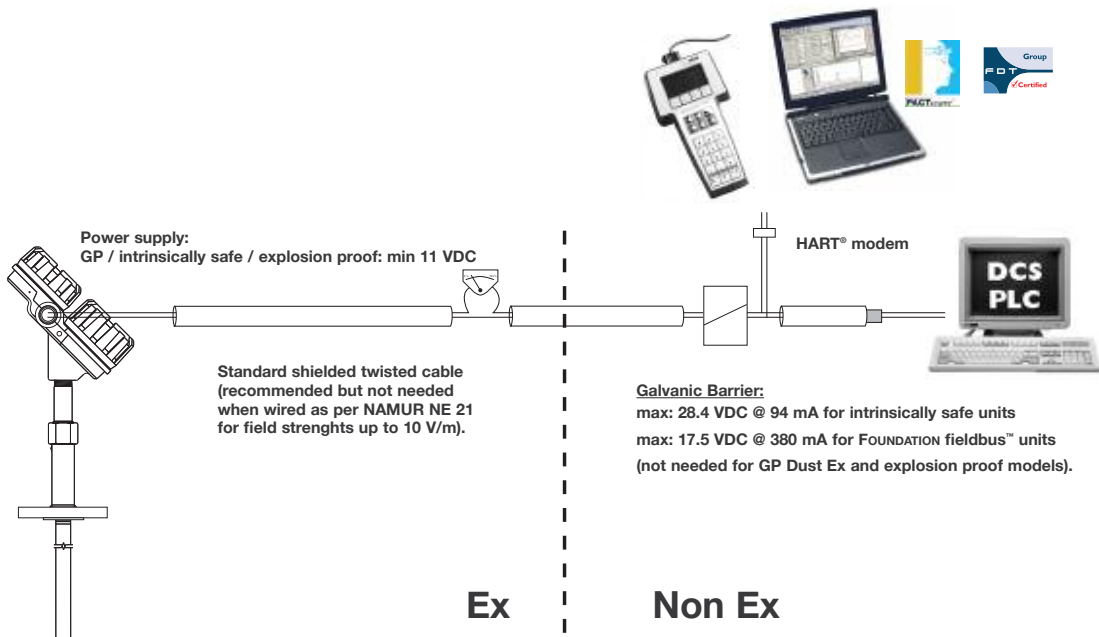


**Eclipse® Housing (45° View)**



**Eclipse® Remote Configurations**

# ELECTRICAL WIRING



# MODEL NUMBER

## ENLARGED COAXIAL PROBE

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

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

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

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

Enlarged Coaxial GWR Probe	
N	316/316L (1.4401/1.4404) SS w/ PEEK® spacers
P	Hastelloy C (2.4819) w/ PEEK spacers
R	Monel (2.4360) w/ PEEK spacers

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

Use min 3" / DN 80 process connection for enlarged coaxial GWR probe (4th digit: N, P & R).

ANSI Flanges

4 1	2"	NPT
4 3	2"	150# ANSI RF ①
4 4	2"	300# ANSI RF ①
4 5	2"	600# ANSI RF ①
5 3	3"	150# ANSI RF
5 4	3"	300# ANSI RF
5 5	3"	600# ANSI RF
6 3	4"	150# ANSI RF
6 4	4"	300# ANSI RF
6 5	4"	600# ANSI RF

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
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

Proprietary Flanges ②

T T	600# Fisher (249B/259B) in carbon steel – as per dimensions of Figure 1 on page 9
T U	600# Fisher (249C) in stainless steel – as per dimensions of Figure 2 on page 9
U T	600# Masoneilan flange in carbon steel – as per dimensions of Figure 3 on page 9
U U	600# Masoneilan flange in stainless steel – as per dimensions of Figure 3 on page 9

PROCESS SEAL – O-RING MATERIAL ③

0	Viton GFLT seal – for universal use	-40 °F (-40 °C) / +400 °F (+200 °C)
2	Kalrez 4079 seal – for aggressive media ④⑤	-40 °F (-40 °C) / +400 °F (+200 °C)
8	Aegis PF 128 seal – for steam ⑥ and NACE applications	-4 °F (-20 °C) / +400 °F (+200 °C)

INSERTION LENGTH ⑦

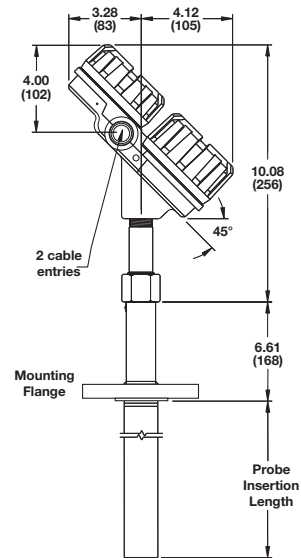
24 to 240 inches (60 to 610 cm)
(unit of measure is determined by second digit of Model Number)
Examples: 24 inches = 024; 60 centimeters = 060

- ① Nozzle/cage must be  $\geq 1.9"$  (48mm)
- ② Always verify dimensions if ANSI/DIN flanges are not used.
- ③ Consult factory for alternative o-ring materials.
- ④ For ammonia/chlorine applications use the 7xD GWR probe.
- ⑤ Consult factory for HF acid applications
- ⑥ Maximum +400° F (+200° C) for use on steam.
- ⑦ Consult factory for insertion lengths < 60 cm (24")

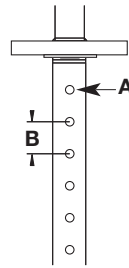


# DIMENSIONAL SPECIFICATIONS

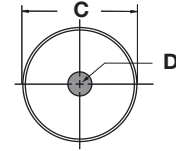
## ENLARGED COAXIAL PROBE – INCHES (MM)



**7xT  
with flanged connection**

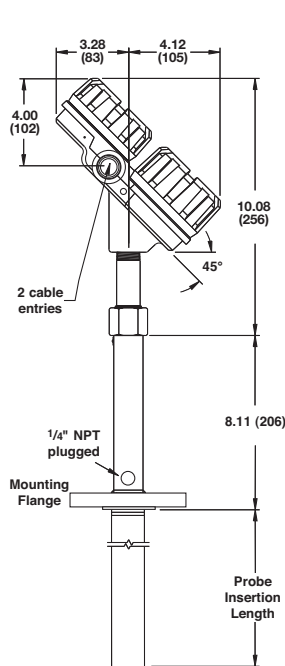


**Venting holes  
for level/interface**

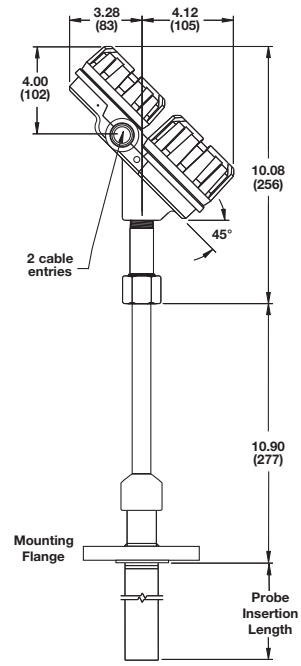


**Coaxial GWR Probe,  
end view**

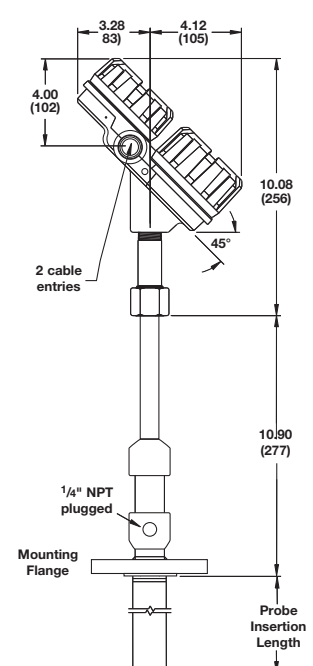
Dim.	Enlarged Coaxial Probe
A	Ø .5" (12.7 mm)
B	1" (25.4 mm)
C	1.75" (45 mm) – SST 1.92" (49 mm) – HC and Monel
D	0.63" (16 mm)



**7xN  
with flanged connection**



**Enlarged 7xD  
with flanged connection**



**Enlarged 7xL  
with flanged connection**

# MODEL NUMBER

## HIGH TEMP. / PRESSURE COAXIAL PROBE

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

7 * D	HHTP GWR probe for level/interface	$\epsilon_r \geq 1.4$ - WHG approved
7 * L	HHTP GWR probe for level/interface with flushing connection	$\epsilon_r \geq 1.4$ - WHG approved

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

MATERIAL OF CONSTRUCTION (all wetted parts) and MINIMUM DIELECTRICS

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

N	316/316L (1.4401/1.4404) SST with PEEK spacers	min. $\epsilon_r \geq 1.4$ / max +650° (+345° C) ①
P	Hastelloy C (2.4819) with PEEK spacers	min. $\epsilon_r \geq 1.4$ / max +650° (+345° C) ①
R	Monel (2.4360) with PEEK spacers	min. $\epsilon_r \geq 1.4$ / max +650° (+345° C) ①

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

Use min 3" / DN 80 process connection for enlarged coaxial GWR probe (4th digit: N, P & R).

ANSI Flanges

4 1	2"	NPT
4 3	2"	150# ANSI RF ②
4 4	2"	300# ANSI RF ②
4 5	2"	600# ANSI RF ②
4 K	2"	600# ANSI RJ ②
4 M	2"	900/1500# ANSI RJ ②
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 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 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

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
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 ③

T T	600# Fisher (249B/259B) in carbon steel ④
T U	600# Fisher (249C) in stainless steel ④
U T	600# Masoneilan flange in carbon steel ④
U U	600# Masoneilan flange in stainless steel ④

PROCESS SEAL

N	Borosilicate seal – for non steam applications (7xD) -320° F (-196° C) / +800° F (+426° C) ④
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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
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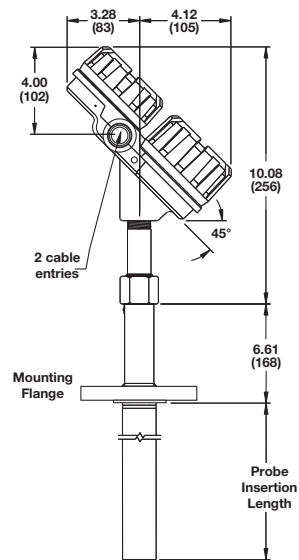
- ① Consult factory for applications above +650° F(+345° C)
- ② Nozzle/cage must be  $\geq 1.9"$  (48mm)
- ③ Always check dimensions if ANSI/EN/DIN flanges are not used.
- ④ As per dimensions on page 9.
- Consult factory for insertion lengths < 24" (60 cm).



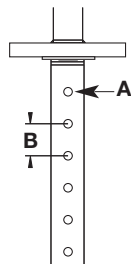


# DIMENSIONAL SPECIFICATIONS

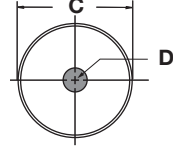
## HIGH TEMP./PRESSURE COAXIAL PROBE – INCHES (MM)



**7xT**  
with flanged connection

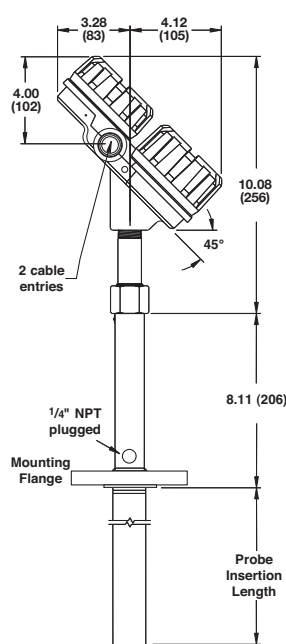


**Venting holes**  
for level/interface

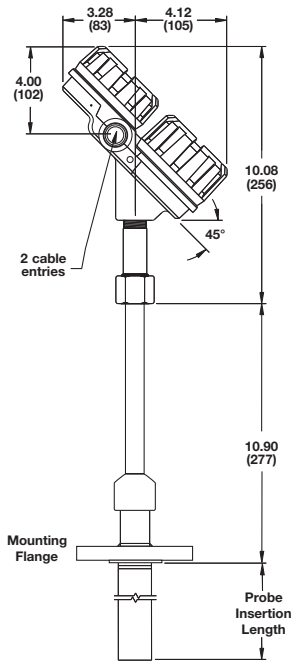


**Coaxial GWR Probe,**  
end view

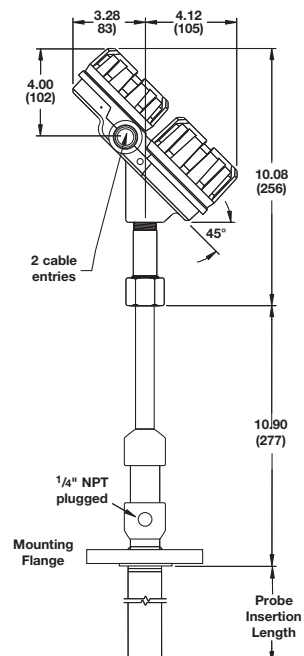
Dim.	Enlarged Coaxial Probe
A	Ø .5" (12.7 mm)
B	1" (25.4 mm)
C	1.75" (45 mm) – SST 1.92" (49 mm) – HC and Monel
D	0.63" (16 mm)



**7xN**  
with flanged connection



**Enlarged 7xD**  
with flanged connection



**Enlarged 7xL**  
with flanged connection

# MODEL NUMBER

## CAGED SINGLE ROD PROBE

BASIC MODEL NUMBER – Suited for external cage mounting only

7 * G	Caged GWR probe for level and interface – dirty liquids (max. 10,000 cP)	$\epsilon_r \geq 1.4$ ①
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\*Specify "E" for English (e.g., 7EG) or "M" for Metric (e.g., 7MG)

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

A	316/316L (1.4401/1.4404) w/ Teflon® bottom spacer ②
B	Hastelloy C (2.4819) w/ Teflon® bottom spacer ②
C	Monel (2.4360) w/ Teflon® bottom spacer ②

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

Flanges are of solid material per selected material of construction

### ANSI RF Flanges

Probes for 2" cages

4 3	2"	150# ANSI RF ①
4 4	2"	300# ANSI RF ①
4 5	2"	600# ANSI RF ①

Probes for 3" cages

5 3	3"	150# ANSI RF
5 4	3"	300# ANSI RF
5 5	3"	600# ANSI RF

Probes for 4" cages

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

### EN/DIN Flanges

Probes for 2" cages

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 80, PN 16	EN 1092-1 Type A

Probes for 3" cages

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

Probes for 4" cages

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

### Proprietary Flanges ③

T T	600# Fisher (249B/259B) in carbon steel ④
T U	600# Fisher (249C) in stainless steel ④
U T	600# Masoneilan flange in carbon steel ④
U U	600# Masoneilan flange in stainless steel ④

PROCESS SEAL – O-RING MATERIAL □ ⑥

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

INSERTION LENGTH ⑦

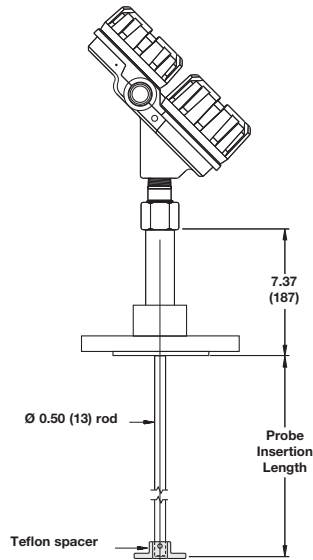
24 to 240 inches (60 to 610 cm) (7xS only: 180 inches (457 cm) maximum) (unit of measure is determined by second digit of Model Number)
Examples: 24 inches = 024; 60 centimeters = 060

- ① For interface measurement; upper liquid:  $\epsilon_r \geq 1.4$  and  $\leq 5$  / lower liquid:  $\epsilon_r \geq 15$ .
- ② PEEK spacers for the probes in for 3" and 4" cages.
- ③ Always check dimensions if ANSI/EN/DIN flanges are not used.
- ④ As per dimensions on page 9.
- ⑤ Consult factory for alternative o-ring materials.
- ⑥ For ammonia/chlorine applications use the 7xD GWR probe.
- ⑦ Consult factory for insertion lengths < 24" (60 cm).

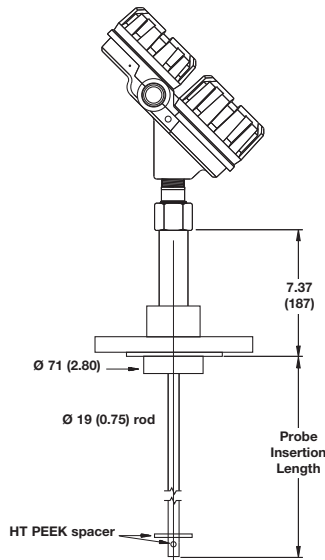


# DIMENSIONAL SPECIFICATIONS

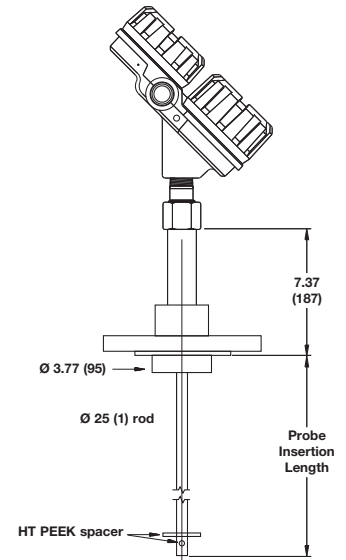
## CAGED SINGLE ROD PROBE - INCHES (MM)



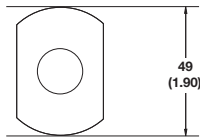
**7xG - 2" cage  
max 240" (6.1 m)**



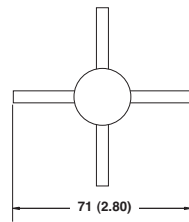
**7xG - 3" cage  
max 240" (6.1 m)**



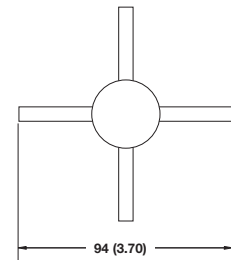
**7xG - 4" cage  
max 240" (6.1 m)**



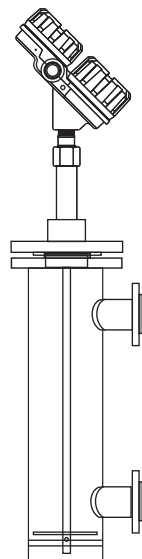
**Spacer (end view)**



**Spacer (end view)**



**Spacer (end view)**



**To order a new cage;  
consult bulletin 41-140**

The MAGNETROL external chambers are self-contained cages designed for use with our top mounting level transmitters or switches. Quality construction and a wide selection of configurations make these cages an ideal means of utilizing the power of our many technologies without mounting directly into the process vessel. For more information request bulletin 41-140.



**Bulletin 41-140  
External Chambers**

# MODEL NUMBER

## STEAM COAXIAL PROBE



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

### BASIC MODEL NUMBER – Suited for saturated steam applications

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

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

### MATERIAL OF CONSTRUCTION (all wetted parts) and MINIMUM DIELECTRICS

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

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

#### Threaded ①

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

#### ANSI Flanges

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

#### EN/DIN Flanges

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

#### Proprietary Flanges ②

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

### PROCESS SEAL – O-RING MATERIAL

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

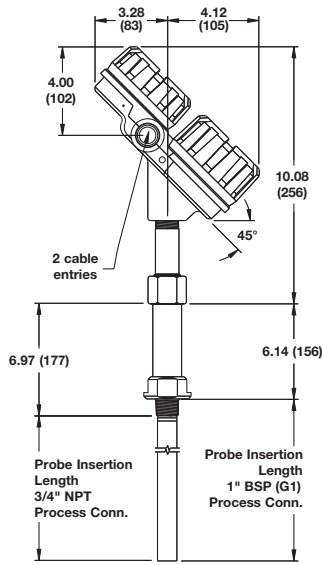
24 to 180 inches (60 to 457 cm) (unit of measure is determined by second digit of Model Number) Examples: 24 inches = 024; 60 centimeters = 060
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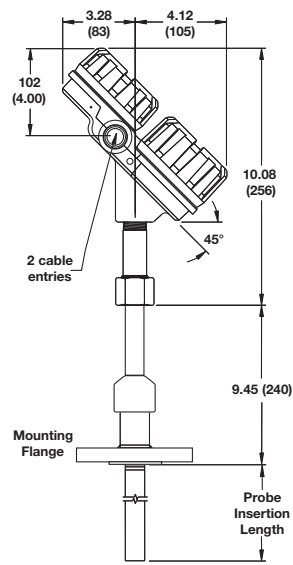
- ① Not available with 7xQ probe.
- ② Always check dimensions if ANSI/DIN flanges are not used.
- ③ As per dimensions on page 9.
- ④ Consult factory for insertion lengths < 24" (60 cm).

# DIMENSIONAL SPECIFICATIONS

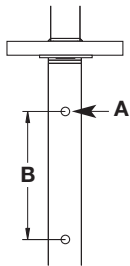
## STEAM COAXIAL PROBE – INCHES (MM)



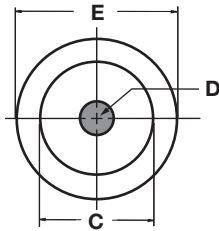
**7xS**  
with threaded connection



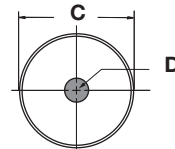
**7xQ or 7xS**  
with flanged connection



Venting holes



**7xQ Coaxial GWR Probe**  
End View



**7xS Coaxial GWR Probe**  
End View

Dim.	Standard Coaxial Probe
A	Ø .25" (6.4 mm)
B	12" (305 mm)
C	0.88" (22.5 mm)
D	0.31" (8 mm)
E	1.25" (31.75 mm)

# MODEL NUMBER

## TOP-IN/BOTTOM-OUT PROBE AND CAGE

To ensure that all dimensions are provided, please specify the following dimensions with your order (see drawings on next page):

- Dimension A: top of process connection to 20 mA point
- Dimension B: bottom of process connection up to 4 mA point
- Level Range, if different from 14" (356 mm)

**Order code for modified models or adders: put an "X" in front of the closest matching order code and specify the modifications/adders separately (e.g., X7EK-K33A-010)**

X = measuring range of 500 mm.

### BASIC MODEL NUMBER – GWR probe suited for in-line external cage mounting

7 E K	Top/Bottom GWR probe and cage—Overfill safe
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#### MATERIAL OF CONSTRUCTION – Wetted parts (including process connection flange when applicable)

	Cages and Flanges	GWR Probe
K	316/316L (1.4401/1.4401)	316/316L (1.4401/1.4404)
M	Carbon steel	

#### PROCESS CONNECTION – SIZE/TYPE

##### Threaded

3 1	1½" NPT Thread
4 1	2" NPT Thread

##### Welded

3 9	1½" Socket Weld
4 9	2" Socket Weld

#### ANSI Flanges

3 3	1½"	150# ANSI Raised Face Flange
3 4	1½"	300# ANSI Raised Face Flange
3 5	1½"	600# ANSI Raised Face Flange
4 3	2"	150# ANSI Raised Face Flange
4 4	2"	300# ANSI Raised Face Flange
4 5	2"	600# ANSI Raised Face Flange

#### LEVEL RANGE

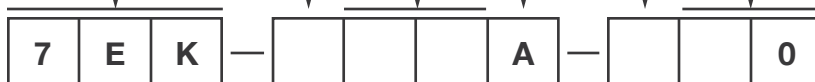
A	14" (356 mm)
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#### OPTIONS

0	None
2	¾" Sight glass connections (sight glass not included)

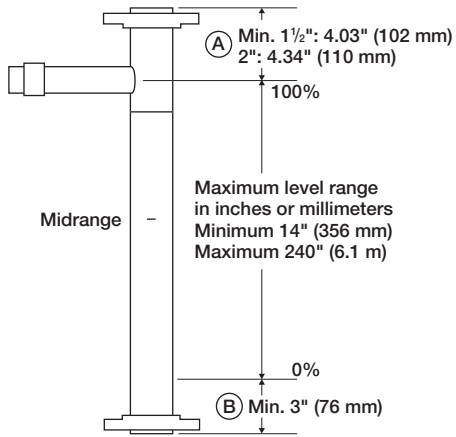
#### LIQUID TYPE / OPERATING TEMPERATURE

1 0	Conductive liquids (min $\epsilon_r \geq 10$ ) max +605 °F (+320 °C)
2 0	All liquids (min $\epsilon_r \geq 1.4$ ) max +500 °F (+260 °C)

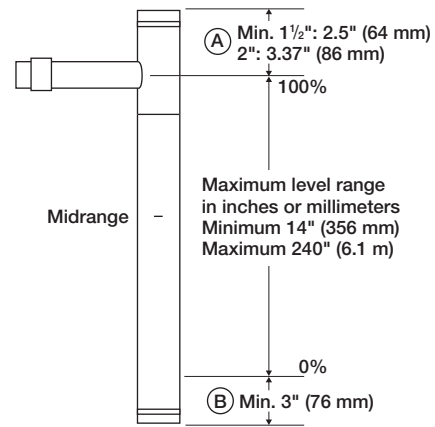


# DIMENSIONAL SPECIFICATIONS

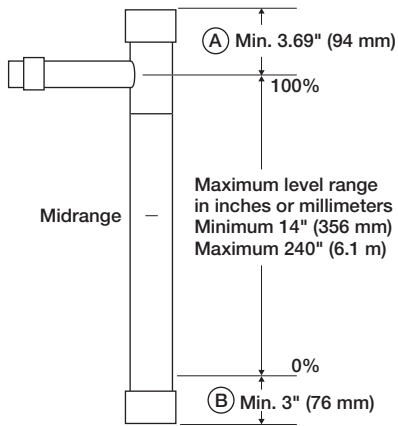
TOP-IN/BOTTOM-OUT - INCHES (MM)



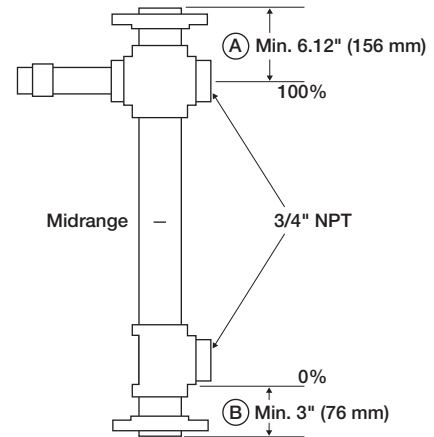
**Flanged  
7EK**



**Threaded  
7EK**



**Welded  
7EK**



**Optional sight glass  
connections**

## QUALITY

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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

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### **E**xpedite **S**hip **P**lan

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

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

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

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

## WARRANTY

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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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**EFFECTIVE: April 2015**  
**SUPERSEDES: February 2012**