

### DESCRIPTION

The Eclipse® 705 Transmitter is a loop-powered, 24 V DC 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” radars.

The Eclipse® 705 offers enhanced reliability, as demonstrated by a Safe Failure Fraction of 91 %.

### FEATURES

- \* “REAL LEVEL”, measurement not affected by media variables eg. dielectrics, pressure, density, pH, viscosity, ...
- \* Easy bench configuration - no need for level simulation.
- \* Two-wire, intrinsically safe loop powered level transmitter.
- \* 20-point custom strapping table for volumetric output.
- \* Housing can be removed without depressurizing the vessel.
- \* Two-line, 8-character LCD and 3-button keypad.
- \* Suitable design for CIP/SIP cleaning.
- \* Integral or remote electronics.
- \* Suited for SIL 1/2 or SIL 2/3 Loops (full FMEDA report available).



### APPLICATIONS

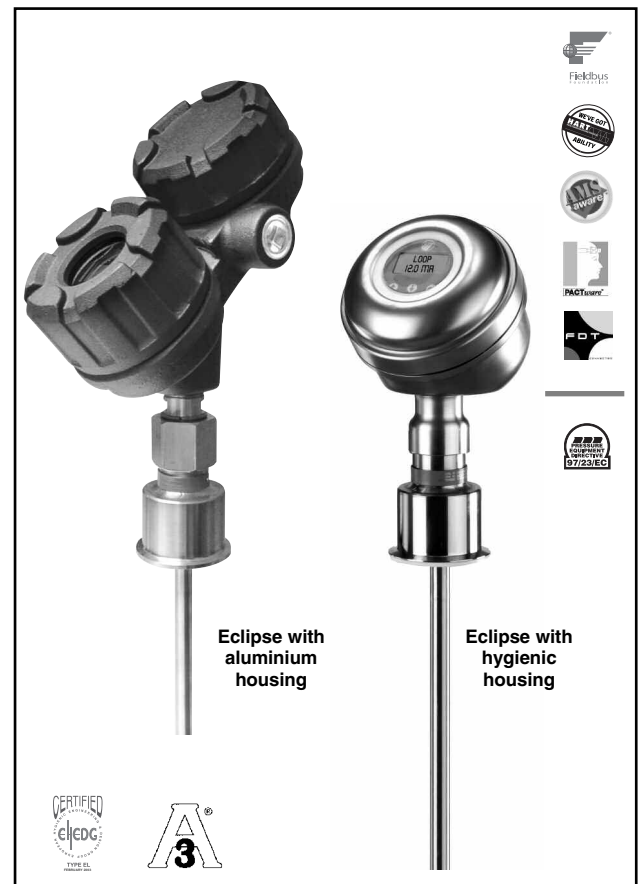
**MEDIA:** From non conductive liquids up to water-based media (dielectric 1,9 - 100).

**VESSELS:** Most process or storage vessels up to max +150 °C @ 5,1 bar (+300 °C @ 75 psig).

**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.

Ask for your free copy of the Eclipse® 705 performance report by WIB/Evaluation International (SIREP)/EXERA.

### Measures real «LEVEL, VOLUME, INTERFACE»



### AGENCY APPROVALS

Agency	Approvals
ATEX Ex	II 3 (1) G EEx nA II T6, non sparking ① II 3 (1) G EEx nA [ia] IIC T6, FNICO – FF non incendive ① II 1 G EEx ia IIC T4, intrinsically safe II 1 G EEx ia IIC T4, FISCO – FF intrinsically safe II 1 / 2 G D EEx d[ia] IIC T6, explosion proof
TNO®	Hygienic Machinery Directive 98/37/EC annex 1, section 2, 1 EN 1672 part 2, Hygienic requirements EHEDG doc. 2 (second edit. March 2000) and doc. 8 (July 1993)
FM/CSA®	Non Incendive / Intrinsically safe / Explosion proof
LRS	Lloyds Register of Shipping (marine applications)
RosTECH/FSTS GOST-K/GGTN-K	Russian Authorisation Standards

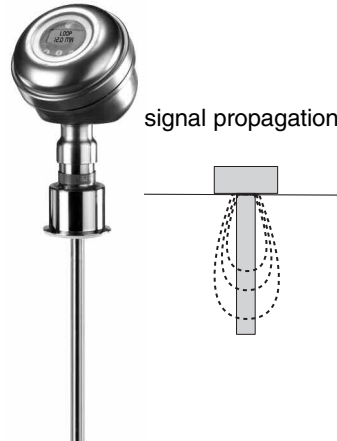
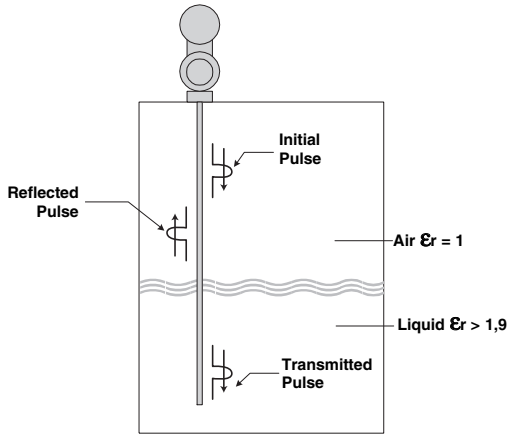
① Probe is intrinsically safe to ATEX II 1 G EEx ia IIC T6 and can be used in zone 0, on flammable liquids.

② Deep drawn stainless steel housings are strictly suited for non flammable area, ATEX intrinsically safe area and FM/CS non incendive and intrinsically safe area.

## TECHNOLOGY

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 travelling time of the pulse is measured via ultra speed timing circuitry that provides an accurate measure of the liquid level.

### Principle of operation



## PACTware® PC SOFTWARE PROGRAM

PACTware 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 radar transmitter with its linear program has always been easy to use. PACTware builds on that ease of use by adding a graphical software interface. Simply connect your PC through the HART® loop and all functionality can be accessed quickly, conveniently, and safely.

Refer to PACTware bulletins 59-101 and 59-601 for more information.



## PROBE & HOUSING FEATURES



### **Stainless steel housing with probe**

Eclipse model 705 transmitter in a 304 stainless steel housing for use in a variety of hygienic applications. A 1/2" diameter 316 stainless steel probe with a 0,4 µm (15 RA) surface finish is available with 3/4" thru 4" Triclover process connections.



### **1 1/2" hygienic connection with bend**

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



### **3/4" hygienic connection without bend**

6 mm (0.25") diameter probes suitable for use in smaller vessels where space is at a premium. Available in lengths up to 180 cm (72")



### **Stainless steel housing**

Compact, single compartment, 304 stainless steel housing designed specifically for hygienic industries.

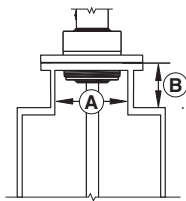
# MOUNTING CONSIDERATIONS FOR SINGLE ROD GWR PROBES

## 1. Turbulence

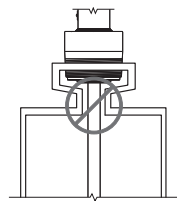
The bottom of the probe should be stabilized if turbulence will cause a deflection of more than 75 mm at 3 m (3" at 10') of length. The probe should not make contact with a metal tank. The use of a capture ring at the lowest point on the probe will prevent unwanted probe movement, while maintaining clean-ability.

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

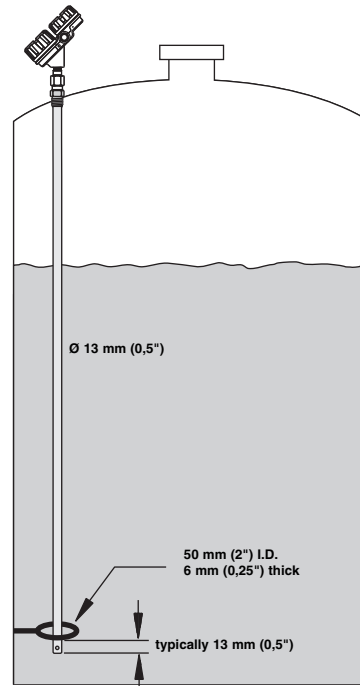
1. Nozzle must be 50 mm (2") or larger diameter.
2. Nozzle inside diameter (**A**) should be  $\geq$  to nozzle height (**B**). If this is not the case, it is recommended to adjust BLOCKING DISTANCE and/or SENSITIVITY settings.
3. Pipe reducers that create restriction should not be used.



Correct installation



Pipe reducers should not be used



## 3. Metallic (conductive) obstructions in tank.

A metal stillwell/cage of max. 6"/DN150 size or a metal tank wall within 450 mm (18") of the probe mounting will allow the unit operate accurately in media with dielectrics down to  $\epsilon_r$  1.9. Other objects in the proximity can cause erroneous readings.

**Note:** objects (eg. shoulders or agitator blades) can be within 6-7 mm (1/4"), if Pactware is used for loop tuning.

Distance to probe	Acceptable objects
< 13 mm (0.5")	Continuous, smooth, parallel, conductive surface (e.g. metal tank wall); probe should not touch tank wall

## 4. Non-metallic vessels

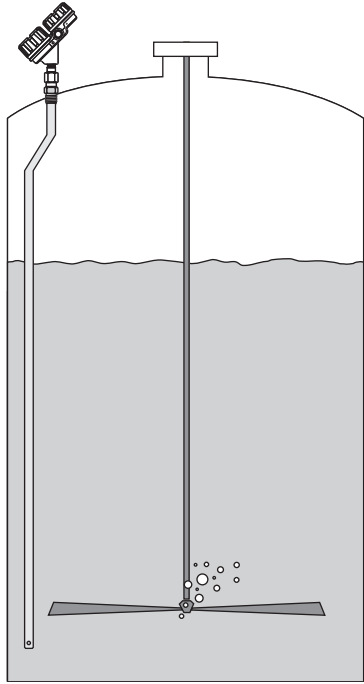
1. Flange (metal) mounting is recommended for optimum performance.
2. Mount probe more than 13 mm (0.5") from vessel-wall.

## High level shutdown / Overfill protection

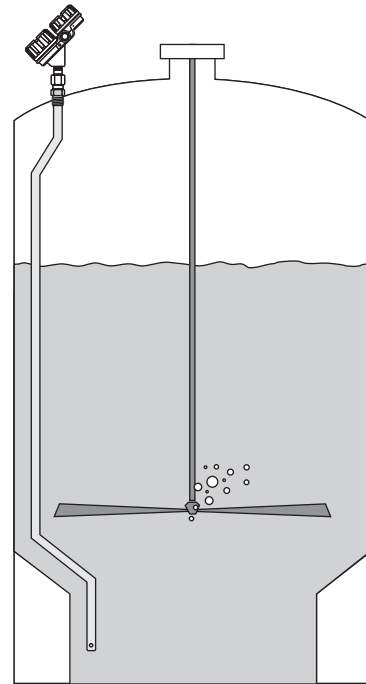
No special considerations are required for water based liquids with  $\epsilon_r > 10$ . For media with  $\epsilon_r < 10$ , ensure that the maximum level is 120 mm (4.8") up to 910 mm (36") below the process connection. Consult factory for further information.

## HYGIENIC APPLICATION EXAMPLES

The model 705 transmitters are presently installed in a variety of media systems including bioreactors, fermenters, media storage, crystallizers, decanters and ultra filtration skid receivers.



**25K Bio reactor**



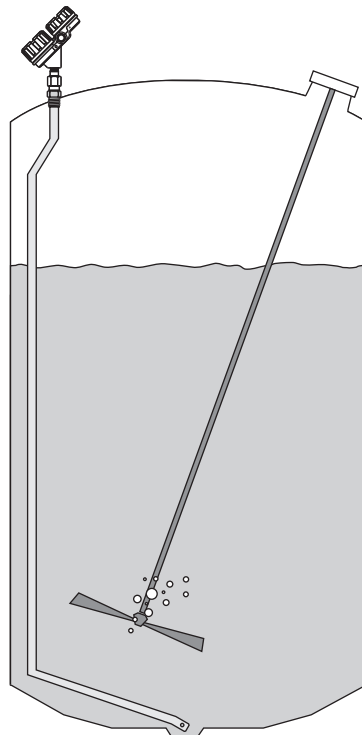
**Tulip tank**

### **Buffers systems including:**

- primary mix tanks
- hold tanks
- day tanks
- bulk tanks

### **CIP systems including:**

- day tanks
- bulk tanks
- skid delivery tanks

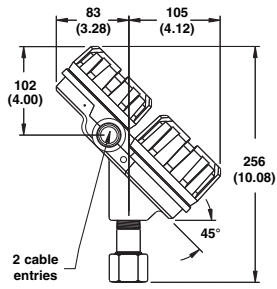


**1500K Fermentor**

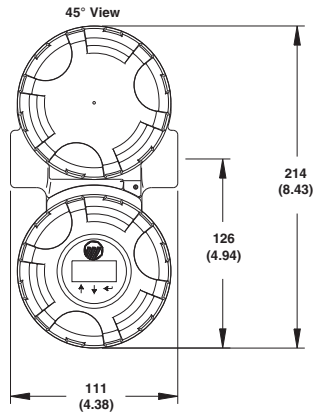
### **Utility systems including:**

- ammonia storage
- CO2 storage
- inlet water
- dearator systems
- condensate receivers
- boiler drums
- fuel oil storage
- various sumps
- waste tanks
- neutralization tanks

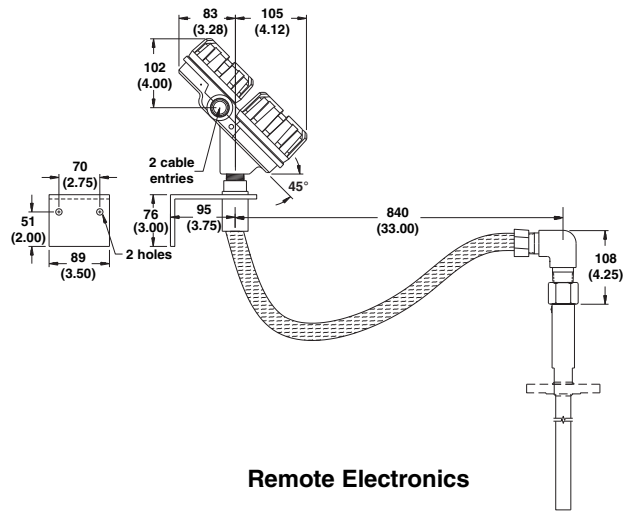
**DIMENSIONS in mm (inches) – ALUMINIUM HOUSING**



**Internal Electronics**

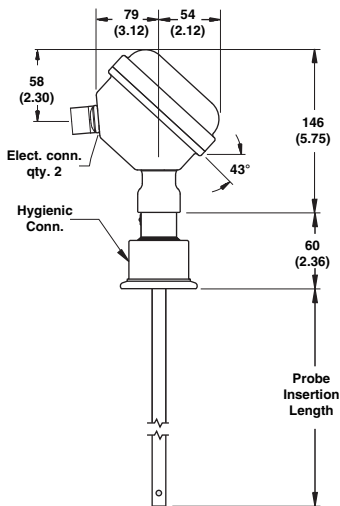


**45° View**

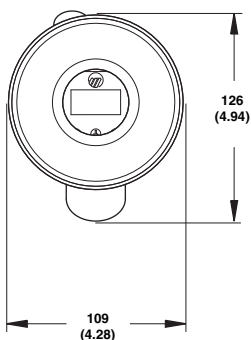


**Remote Electronics**

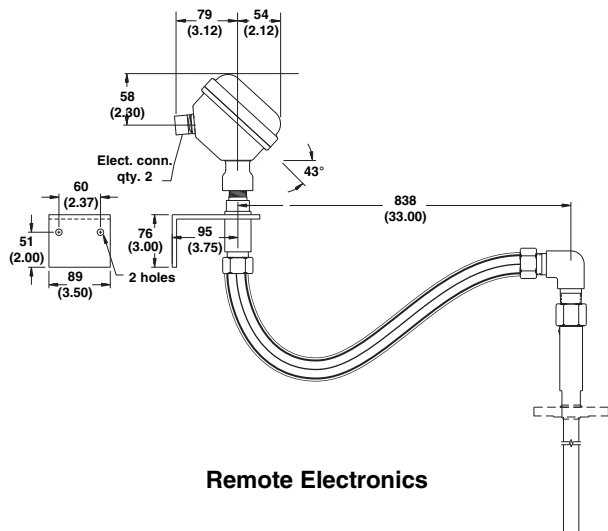
**DIMENSIONS in mm (inches) – STAINLESS STEEL HYGIENIC HOUSING**



**Internal Electronics**



**43° View**



**Remote Electronics**

## EXPEDITE SHIP PLAN (ESP)

Several Eclipse Guided Wave Radar Transmitters are available for quick shipment, within max. 3 weeks after factory receipt of purchase order, through the Expedite Ship Plan (ESP).

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

To take advantage of ESP, simply match the colour 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.

## SELECTION DATA

**A complete measuring system consists of:**

1. Eclipse 705 transmitter head/electronics
2. Eclipse 7MF GWR probe
3. Free of charge: Magnetrol master C.D. with Eclipse DTM (PACTWARE®) - order code: **090-BE59-200** (included in each order)

### 1. Order code for ECLIPSE 705 transmitter head/electronics

BASIC MODEL NUMBER

7 0 5	Eclipse 705 guided wave radar transmitter
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#### POWER

5	24 V DC, two wire loop powered
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#### SIGNAL OUTPUT AND ELECTRONICS

1 0	4-20 mA with Hart – standard electronics (SFF of 85.4%)
1 A	4-20 mA with Hart – SIL enhanced electronics (SFF of 91%)
2 0	Fieldbus communication

#### ACCESSORIES

A	Digital display and keypad
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#### MOUNTING/CLASSIFICATION (Consult factory for FM/CSA approvals)

1	Integral, Non flammable area
2	Remote, Non flammable area
A	Integral, ATEX II 1 G EEx ia IIC T4 – FISCO ATEX, intrinsically safe for units with Fieldbus Foundation
B	Remote, ATEX II 1 G EEx ia IIC T4 – FISCO ATEX, intrinsically safe for units with Fieldbus Foundation
C	Integral, ATEX II 1/2 G D EEx d[ia] IIC T6 T85 °C
D	Remote, ATEX II 1/2 G D EEx d[ia] IIC T6 T85 °C
E	Integral, ATEX II 3 (1) G EEx nA II T6, non sparking Integral, ATEX II 3 (1) G EEx nA [ia] IIC T6, FNICO – FF non incendive
F	Remote, ATEX II 3 (1) G EEx nA II T6, non sparking Remote, ATEX II 3 (1) G EEx nA [ia] IIC T6, FNICO – FF non incendive

#### MATERIAL OF CONSTRUCTION

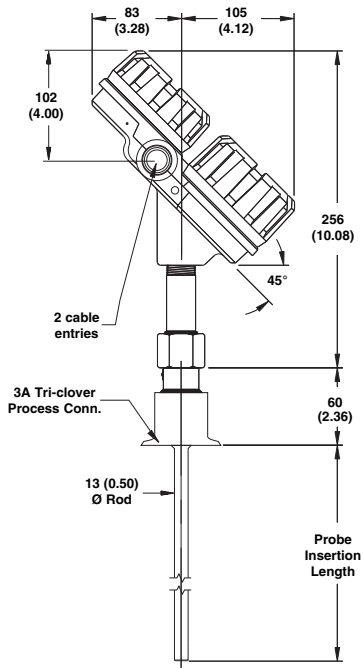
1 1	Cast aluminium dual compartment – M20 x 1.5 (2 entries - one plugged)
1 0	Cast aluminium dual compartment – 3/4" NPT (2 entries - one plugged)
3 1	Deep drawn 304 SST dual compartment – M20 x 1.5 (2 entries - one plugged)
3 4	Deep drawn 304 SST dual compartment – 1/2" NPT (2 entries - one plugged)

Note: deep drawn stainless steel housings are suited for non flammable area (Approval codes 1 and 2) or ATEX intrinsically safe area (Approval codes A and B).

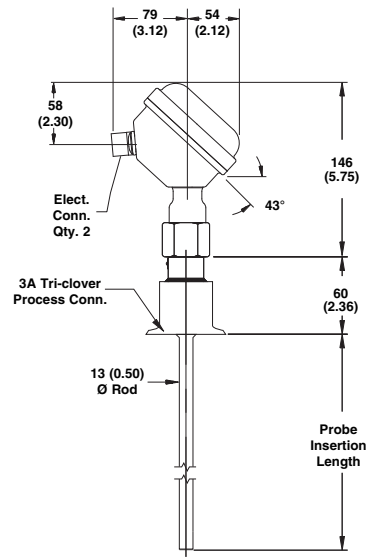
7 0 5	5						
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**complete order code for ECLIPSE 705 transmitter head/electronics**

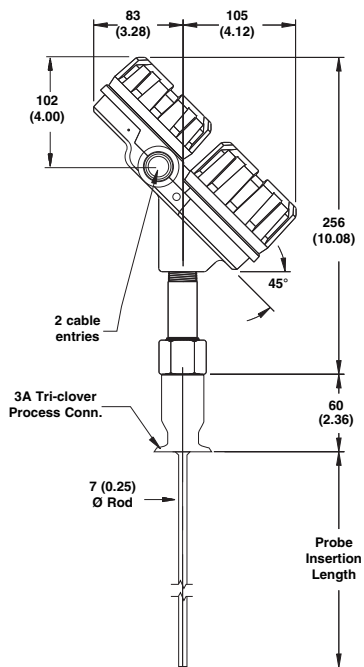
DIMENSIONS in mm (inches)



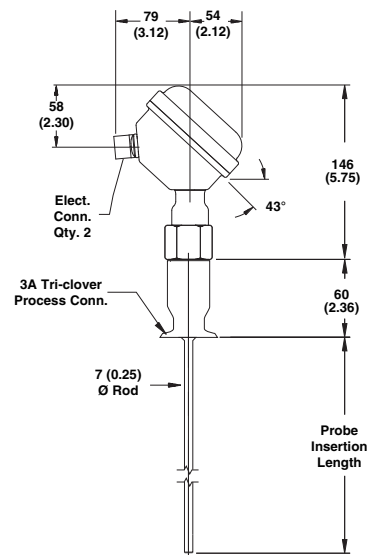
**Aluminium housing  
with hygienic  
1" - 4" Tri-clover connection  
max. 6 m (240")**



**Stainless steel housing  
with hygienic  
1" - 4" Tri-clover connection  
max. 6 m (240")**



**Aluminium housing  
with hygienic  
3/4" Tri-clover connection  
max. 1,80 m (72")**



**Stainless steel housing  
with hygienic  
3/4" Tri-clover connection  
max. 1,80 m (72")**

2. Order code for ECLIPSE 705 - hygienic CIP/SIP GWR probe (finished to 0,4 µm - RA 15) for liquids

BASIC MODEL NUMBER

7 M F	hygienic CIP/SIP GWR probe	(dielectric range: ≥ 1,9/10)
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PROBE MATERIAL (finished to 0,4 µm - RA 15)

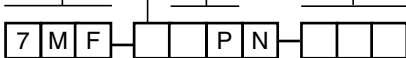
E	316/316L (1.4401/1.4404) stainless steel
G	ALXN stainless steel (UNS N° 8367)
H	Hastelloy C22 (2.4602)

PROCESS CONNECTION - SIZE/TYPE

2 P	3/4" - 3A Tri-clover compatible 16 AMP fitting
3 P	1" or 1 1/2" - 3A Tri-clover compatible 16 AMP fitting
4 P	2" - 3A Tri-clover compatible 16 AMP fitting
5 P	3" - 3A Tri-clover compatible 16 AMP fitting
6 P	4" - 3A Tri-clover compatible 16 AMP fitting

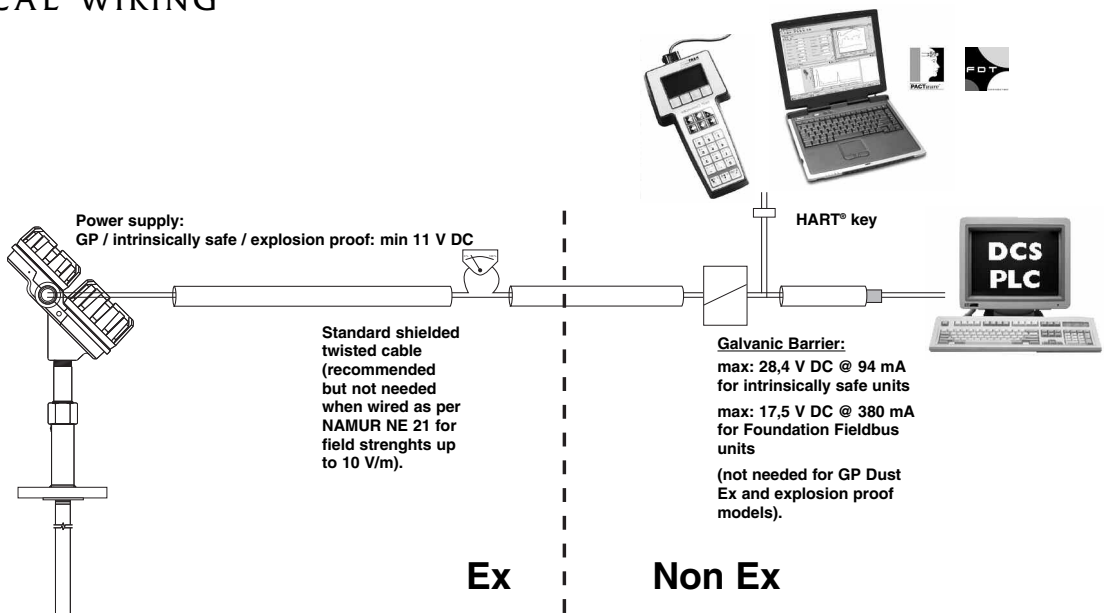
INSERTION LENGTH – Specify insertion length per cm (0.39") increments

0 6 0	minimum 60 cm (24") insertion length
1 8 0	maximum 180 cm (72") insertion length for 3/4" process conn. size (code 2P)
6 1 0	maximum 610 cm (240") insertion length for 1" up to 4" process conn. size



complete order code for ECLIPSE hygienic CIP/SIP - GWR probe

ELECTRICAL WIRING



# TRANSMITTER SPECIFICATIONS

## FUNCTIONAL/PHYSICAL

Description		Specification
Power (at terminals)		Non flammable area: 11 to 36 V DC ATEX Intrinsically Safe: 11 to 28,6 V DC ATEX Explosion Proof (with Intrinsically Safe probe) 11 to 36 V DC Foundation Fieldbus (FISCO ATEX Exi): 9 to 17,5 V DC Foundation Fieldbus (FNICO & Exd): 9 to 32 V DC
Signal Output		4-20 mA with HART®, 3,8 mA to 20,5 mA useable (meets NAMUR NE 43) or Foundation Fieldbus H1 (ITK Ver. 4)
Span		150 to 6100 mm (6 to 240")
Resolution		Analog: 0,01 mA Display: 0,1 cm (inch)
Loop Resistance		630 Ω @ 20,5 mA - 24 V DC
Damping		Adjustable 0-10 s
Diagnostic Alarm		Adjustable 3,6 mA, 22 mA, HOLD
User Interface		HART® communicator, AMS® or PACTware®, Foundation Fieldbus and/or 3-button keypad
Display		2-line x 8-character LCD
Menu Language		English/Spanish/French/German (Foundation Fieldbus: English)
Housing Material		IP 66/Aluminium A356T6 (< 0.20 % copper) or deep drawn 304 stainless steel
Approvals	Aluminium housing	ATEX II 3 (1) G EEx nA II T6, non sparking (probe can be used in flammable liquids) ATEX II 3 (1) G EEx nA [ia] IIC T6, FNICO – FF non incendive (probe can be used in flammable liquids) ATEX II 1 G EEx ia IIC T4, intrinsically safe ATEX II 1 G EEx ia IIC T4, FISCO – FF intrinsically safe ATEX II 1 / 2 G D EEx d[ia] IIC T6, explosion proof <sup>①</sup> FM and CSA, Non incendive, intrinsically safe (FISCO) and explosion proof LRS – Lloyds Register of Shipping (marine applications) GOST-K/GGTN-K – RosTech/FSTS – Russian Authorisation Standards
	Stainless Steel housing	ATEX II 1 G EEx ia IIC T4, intrinsically safe FM and CSA, Non incendive and intrinsically safe
SIL <sup>②</sup> (Safety Integrity Level)	Standard electronics	Functional safety to SIL 1 / SIL 2 in accordance to 61508 – SFF of 85,4 % – full FMEDA reports and declaration sheets available at request
	Enhanced electronics	Functional safety to SIL 2 / SIL 3 in accordance to 61508 – SFF of 91 % – full FMEDA reports and declaration sheets available at request
Electrical Data		U <sub>i</sub> = 28,4 V, I <sub>i</sub> = 94 mA, P <sub>i</sub> = 0,67 W U <sub>i</sub> = 0,56 V, I <sub>i</sub> = 380 mA, P <sub>i</sub> = 5,32 W (Foundation Fieldbus)
Equivalent Data		C <sub>i</sub> = 2,2 nF, L <sub>i</sub> = 3 μH C <sub>i</sub> = 0,24 nF, L <sub>i</sub> = 3 μH (Foundation Fieldbus)
Shock/Vibration Class		ANSI/ISA-571.03 SA1 (Shock), ANSI/ISA-571.03 VC2 (Vibration)
Net and Gross Weight	Cast aluminium	2,70 kg net; 3,20 kg gross – amplifier only
	Stainless steel	5,70 kg net; 6,20 kg gross – amplifier only
Overall Dimensions		H 214 mm (8.43") x W 111 mm (4.38") x D 188 mm
Foundation Fieldbus specifications	ITK Version	4.61
	H1 Device Class	Link Master (LAS) – selectable ON/OFF
	H1 Profile Class	31PS, 32L
	Function Blocks	1 x RB(s), 4 x AI (s) and 1 x TB (c)
	Quiescent current draw	15 mA
	Execution time	15 ms
	CFF files	Downloads available from Host system supplier or <a href="http://www.fieldbus.org">www.fieldbus.org</a>

<sup>①</sup> ATEX, explosion proof units use EEx d bushing material STYCAST 2057 FR.

<sup>②</sup> Not applicable for Foundation Fieldbus units.

## PERFORMANCE

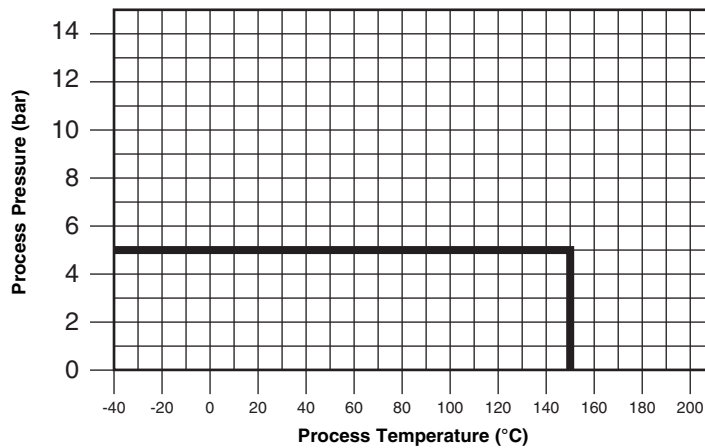
<i>Description</i>		<i>Specification</i>
Linearity	water based liquid	< 0,1 % of probe length or 2,5 mm (0.1"), whichever is greater
	oil based liquid	< 0,3 % of probe length or 8 mm (0.3"), whichever is greater
Accuracy	water based liquid	< 0,1 % of probe length or 2,5 mm (0.1"), whichever is greater
	oil based liquid	± 0,5 % of probe length or 13 mm (0.5"), whichever is greater
Resolution		± 2,5 mm (0.1")
Repeatability		< 2,5 mm (0.1") (± 0,025 % of volume when using strapping table)
Hysteresis		< 2,5 mm (0.1")
Response Time		< 1 second
Warm-up Time		< 5 seconds
Ambient Temp.		-40 °C to +80 °C (-40 °F to +175 °F) – blind transmitter -20 °C to +70 °C (-5 °F to +160 °F) – with digital display -40 °C to +70 °C (-40 °F to +160 °F) – for EEx ia and EEx d[ia] with blind transmitter -20 °C to +70 °C (-5 °F to +160 °F) – for EEx ia and EEx d[ia] with digital display
Process Dielectric Effect		< 7,5 mm (0.3") within selected range
Operating Temp. Effect		Approx. +0,02 % of probe length/°C for probes ≥ 2,5 m (8')
Humidity		0-99 %, non-condensing
Electromagnetic Compatibility		Meets CE requirements (EN-61326) and NAMUR NE 21 (must be used in metallic vessel or stillwell)

## PROBE SPECIFICATIONS

<i>Description</i>		<i>GWR probe specifications</i>
Materials	Probe	316/316L (1.4401/1.4404), Hastelloy C22 (2.4602) or ALXN stainless steel (UNS N° 8367)
	Process seal	PTFE flange facing
Probe diameter		13 mm (0.50") or 7 mm (0.25")
Mounting		See mounting considerations on page 4
Process Connection		3/4" up to 4" – 3A Tri-clover compatible 16 AMP fittings
Probe length		From 600 mm to 6100 mm (24" to 240") (selectable per 1 cm)
Blocking distance (top)		0 mm up to 910 mm (0" up to 36") - depending probe length (adjustable)
Transition Zone <sup>①</sup> (bottom)		ε <sub>r</sub> ≥ 10: 25 mm (1")
Process Temp.	Max	+150 °C @ 5 bar (+300 °F @ 73 psi) ambient
	Min	-40 °C @ 5 bar (-40 °F @ 73 psi)
Max Process Pressure		5 bar @ +150 °C (73 psi @ +300 °F)
Max Viscosity		10.000 cP – consult factory in case of agitation/turbulence
Dielectric Range		ε <sub>r</sub> 10-100 (depending installation conditions, down to ε <sub>r</sub> ≥ 1,9) – liquids
Media coating		Max error of 10 % of coated length. % Error is related to dielectric of medium, thickness of coating and coated probe length above level.

<sup>①</sup> Transition Zone (zone with reduced accuracy) is dielectric dependent; ε<sub>r</sub> = dielectric permittivity. It is recommended to set 4-20 mA signal outside transition zones.

# TEMPERATURE-PRESSURE RATING FOR ECLIPSE PROBE SEALS



## QUALITY ASSURANCE - ISO 9001:2000

THE QUALITY ASSURANCE SYSTEM IN PLACE AT MAGNETROL GUARANTEES THE HIGHEST LEVEL OF QUALITY DURING THE DESIGN, THE CONSTRUCTION AND THE SERVICE OF CONTROLS. OUR QUALITY ASSURANCE SYSTEM IS APPROVED AND CERTIFIED TO **ISO 9001:2000** AND OUR TOTAL COMPANY IS COMMITTED TO PROVIDING FULL CUSTOMER SATISFACTION BOTH IN QUALITY PRODUCTS AND QUALITY SERVICE.

## PRODUCT WARRANTY

ALL MAGNETROL ELECTRONIC AND ULTRASONIC LEVEL CONTROLS ARE WARRANTED FREE OF DEFECTS IN MATERIALS AND 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 INTERNATIONAL 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 THE EQUIPMENT. THERE ARE NO OTHER WARRANTIES EXPRESSED OR IMPLIED, EXCEPT, SPECIAL WRITTEN WARRANTIES COVERING SOME MAGNETROL PRODUCTS.



BULLETIN N°:  
EFFECTIVE:  
SUPERSEDES:

BE 57-110.0  
JULY 2007  
New

### UNDER RESERVE OF MODIFICATIONS

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www.magnetrol.com

### OUR NEAREST REPRESENTATIVE