HORIZON™ 704

Guided Wave Radar Level Transmitter

DESCRIPTION

The Horizon® 704 is a loop-powered, 24 V DC liquid-level transmitter based on the revolutionary Guided Wave Radar (GWR) technology. The electronics of the Horizon® 704 is integral mount on the GWR probe and allows local configuration via a 3 pushbutton keypad / LCD screen. The Horizon® 704 electronics are compatible with different types of GWR probes each encompassing different application challenges (coaxial or twin rod types). The aluminium or Lexan® housing can be removed for service under process conditions.

FEATURES

- "Real Level", measurement not affected by changing media variables eg. dielectrics, pressure, density, pH, viscosity, ...
- Easy bench configuration - no need for level simulation.
- 2-line x 8-character LCD / 3-pushbutton keypad or blind transmitter.
- Two-wire, intrinsically safe loop powered level transmitter.
- Housing can be easily removed without depressurizing the vessel.
- HART®/AMS® digital communication.
- Max process temperature: 200 °C (400 °F).
- Max process pressure: 70 bar (1000 psi).
- 4-20 mA output (meets NAMUR NE 43).
- Integral mount electronics.

APPLICATIONS

MEDIA: Liquids or slurries; hydrocarbons to water-based media (dielectric 1,7 - 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, coating / build up, surface agitation, turbulence and varying dielectric media or specific gravity.

TECHNOLOGY

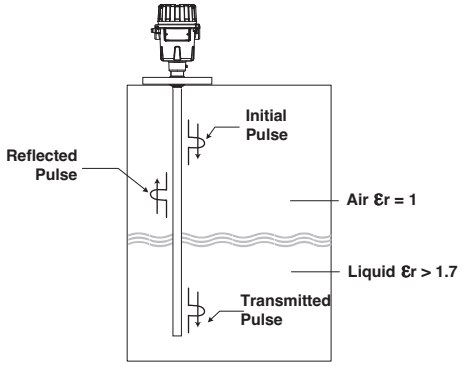
Horizon Guided Wave Radar is based upon the technology of TDR (Time Domain Reflectometry). TDR utilizes pulses of electromagnetic energy, which are transmitted down a probe. When a pulse reaches a liquid surface that has a higher dielectric than the air/vapor in which it is travelling, the pulse is reflected.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

Measures «Real Level»

AGENCY APPROVALS

Agency	*Approval*
ATEX	II 1 G Ex ia IIC T4 Ga, intrinsically safe
FM/CSA①	
Russian Authorisation Standards①	
Other approvals are available, consult factory for more details	

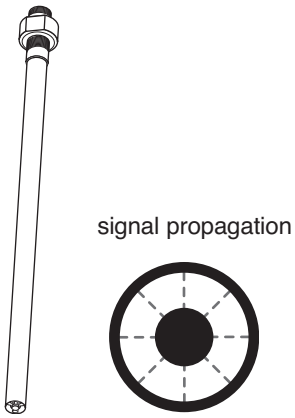
① Consult factory for proper model numbers and classifications



PROBE OVERVIEW

Choosing the proper Guided Wave Radar (GWR) probe is the most important decision in the application process. The probe configuration establishes fundamental performance characteristics. Coaxial and twin rod are the 2 basic configurations used today; each with specific strengths and weaknesses.

COAXIAL TYPE GWR PROBE



end view

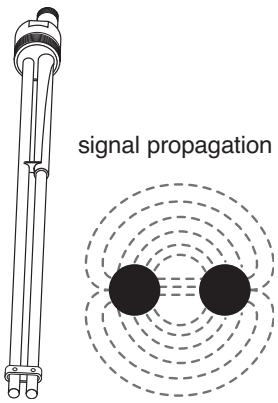
Ideally suited for:

- media ≥ 1,7
- mounting in by-pass cages
- most efficient GWR probe

Beware of:

- clogging / buid up inside coaxial tube (max 500 cP)

TWIN ROD TYPE GWR PROBE



end view

Ideally suited for:

- media ≥ 2,5
- allows moderate build up (viscosity up to 1500 cP)

Beware of:

- bridging build up between the two rods

SELECTION DATA

A complete measuring system consists of:

1. Horizon® 704 transmitter head/electronics
2. Horizon® 704 GWR probe

1. Order code for HORIZON 704 transmitter head/electronics

BASIC MODEL NUMBER

7 0 4	Horizon 704 guided wave radar transmitter

POWER

5	24 V DC, two wire

OUTPUT

1	4-20 mA with HART® communication
0	4-20 mA only (requires local display and keypad - Accessories code A)

MENU LANGUAGE (Hart® communication is only available in English language)

1	English
2	Spanish
3	French
4	German

ACCESSORIES

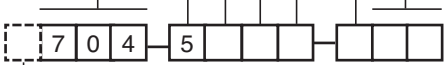
A	Plug in digital display and keypad
0	Blind transmitter (no display/keypad) – only available for units with HART® communication

MOUNTING/APPROVAL

1	Integral mount, Weatherproof
A	Integral mount, ATEX II 1 G Ex ia IIC T4 Ga (needs cast aluminium housing)

HOUSING / CABLE ENTRY

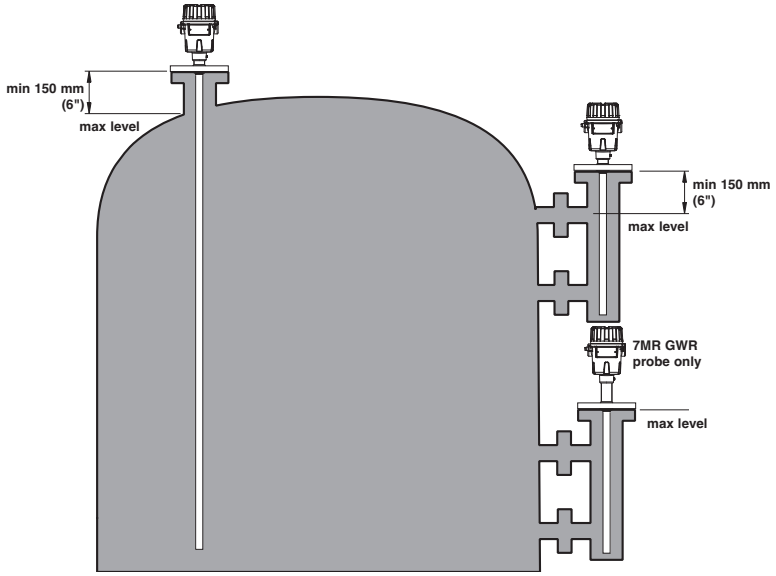
3 0	Lexan® plastic, 3/4" NPT cable entry (2 entries - cable gland and plug incl.)
4 1	Cast aluminium, M20 x 1,5 cable entry (2 entries - 1 plugged)
4 0	Cast aluminium, 3/4" NPT cable entry (2 entries - 1 plugged)



complete order code for HORIZON 704 transmitter head/electronics

X = product with a specific customer requirement

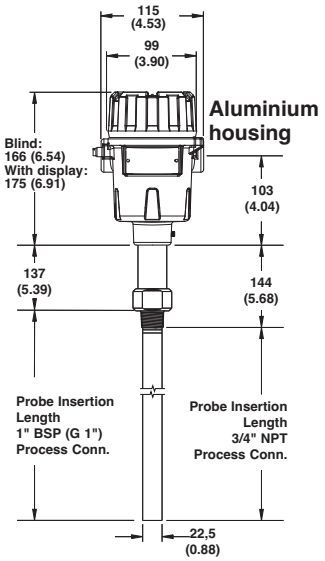
MOUNTING 7MR/7MB



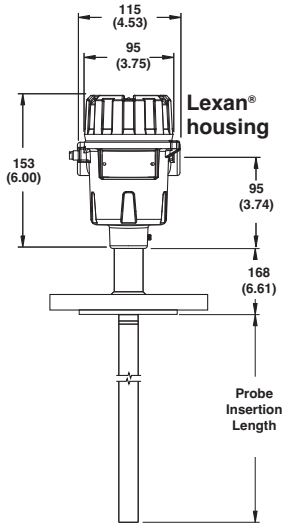
High level shutdown / Overfill protection

Special consideration is necessary in any application where guided wave radar is to be used for high level shutdown / overfill protection. To ensure proper measurement, the guided wave radar probe should be installed so the maximum overfill level is a minimum of 150 mm (6") (for 7MB only) below the process connection. This may include utilizing a nozzle or spool piece to raise the probe. No special precautions are required for the 7MR probe.

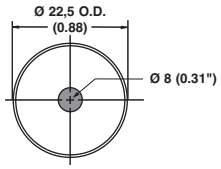
DIMENSIONS in mm (inches)



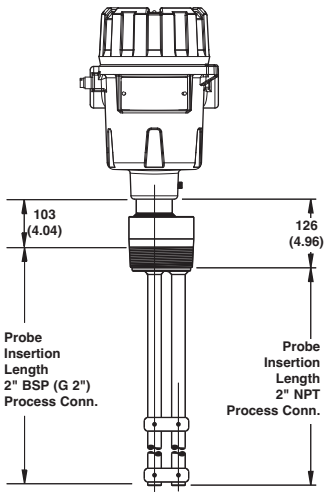
Horizon 7MR with threaded connection



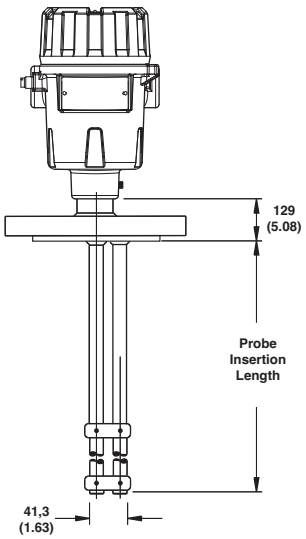
Horizon 7MR with flanged connection



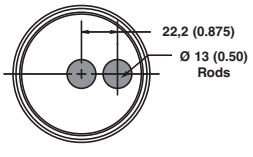
Coaxial GWR Probe, End View



Horizon 7MB with threaded connection



Horizon 7MB with flanged connection



Twin Rod GWR Probe, End View

2. Order code for HORIZON 704 Coaxial or Twin rod GWR probe

BASIC MODEL NUMBER

7 M R	Overfill safe coaxial GWR probe	(dielectric range: ≥ 1,7)
7 M B	Twin rod GWR probe	(dielectric range: ≥ 2,5)

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

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

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

7MR – Threaded

1 1	3/4" NPT
2 2	1" BSP (G 1")

7MB – Threaded

4 1	2" NPT
4 2	2" BSP (G 2")

7MR – ANSI flanges

2 3	1"	150 lbs ANSI RF
2 4	1"	300 lbs ANSI RF
2 5	1"	600 lbs ANSI RF
3 3	1 1/2"	150 lbs ANSI RF
3 4	1 1/2"	300 lbs ANSI RF
3 5	1 1/2"	600 lbs ANSI RF
4 3	2"	150 lbs ANSI RF
4 4	2"	300 lbs ANSI RF
4 5	2"	600 lbs ANSI RF

7MR/7MB – ANSI flanges

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

7MR – 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
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
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

7MR/7MB – EN (DIN) flanges

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

PROCESS SEAL - MATERIAL ①

0	Viton® GFLT seal - for universal use	Min. -40 °C (-40 °F) / +200 °C (+400 °F)
8	Aegis PF 128 seal - for aggressive media / steam②	Min. -20 °C (-4 °F) / +200 °C (+400 °F)

① Consult factory for alternative seal materials
① Max +150 °C (+300 °F) for use on steam

INSERTION LENGTH – Specify per cm (0.39") increment

0 6 0	min 60 cm (24")
4 9 0	max 490 cm (192")

complete order code for HORIZON 704 Coaxial or Twin Rod GWR probe

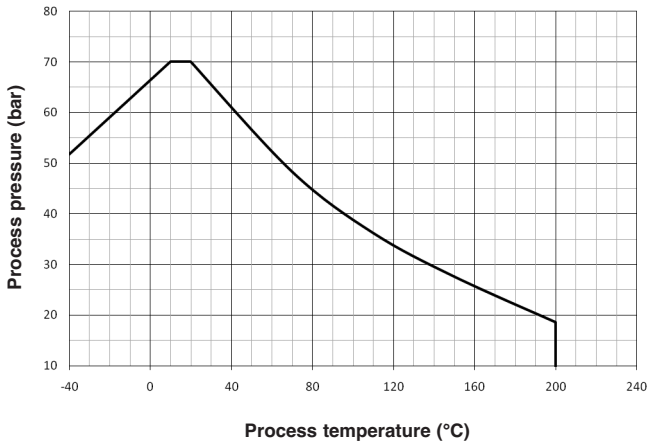
X = product with a specific customer requirement

PROBE SPECIFICATIONS

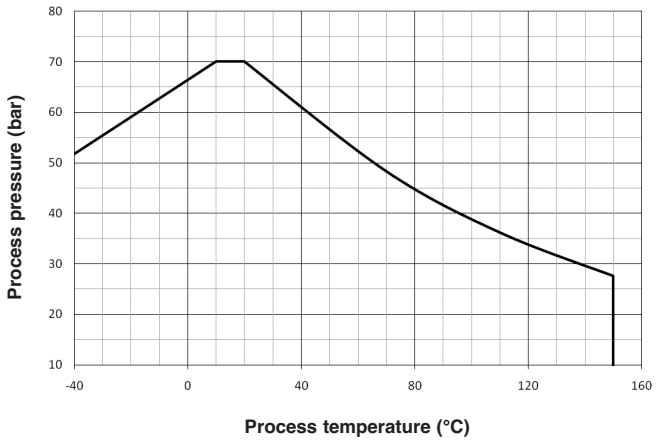
Description		*7MR: coaxial GWR probe*	*7MB: twin rod GWR probe*
Materials	Probe	316/316L (1.4401/1.4404), Hastelloy® C (2.4819) or Monel® (2.4360)	
	Process seal	Teflon® with Viton® GFLT or Aegis PF 128 (Consult factory for alternatives)	
Probe diameter		Inside rod: 8 mm (0.315") – Outer tube: 22,5 mm (0.88")	Two 13 mm (0,5") Ø rods – 22,2 mm (0.875") ℄ to ℄
Mounting		External cage and/or in-tank mounting	In-tank mounting only. Twin rod probe must be used in metallic vessel or stillwell > 25 mm (1") from any surface or obstruction.
Process Connection		Threaded: 3/4" NPT or 1" BSP (G 1") Flanged: Various ANSI or EN (DIN) flanges	Threaded: 2" NPT or 2" BSP (G 2") Flanged: Various ANSI or EN (DIN) flanges
Probe length		From 60 cm to 490 cm (24 to 192")	
Transition Zone①	Top	0 mm (0")	$\varepsilon r \geq 2,5$ = 150 mm (6")
	Bottom	εr: 2,0 = 150 mm (6") / εr: 80 = 25 mm (1")	εr: 2,5 = 150 mm (6")/εr: 80 = 25 mm (1")
Process Temp.②	Max	+200 °C @ 18,6 bar (+400 °F @ 270 psi)	+150 °C @ 27,6 bar (+300 °F @ 400 psi)
	Min	-40 °C @ 51,7 bar (-40 °F @ 750 psi)	
Max Process Pressure②		70 bar @ +20 °C (1000 psi @ +70 °F)	
Max Viscosity		500 cP	1500 cP
Dielectric Range		1,7 to 100	2,5 to 100
Vacuum service		Negative pressure but not hermetic seal	
Media coating		Not recommended in case of media coating	Film: 3% error of coated length, bridging not recommended③

PRESSURE/TEMPERATURE RATING – PROBE SEALS

7MR probes



7MB probes



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

② See graphs.

③ Bridging is defined as continuous accumulation of material between the probe elements.

TRANSMITTER SPECIFICATIONS

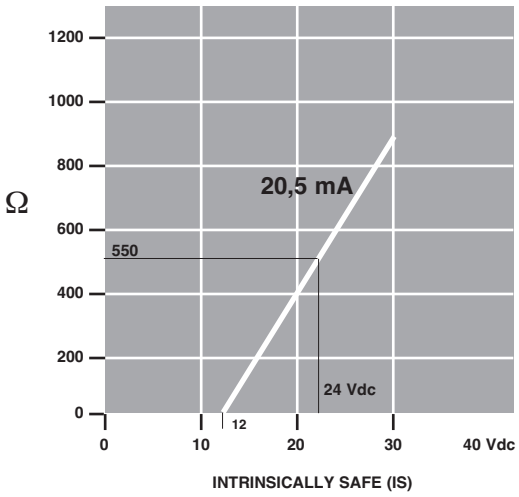
FUNCTIONAL/PHYSICAL

Description	*Specification*
Power (at terminals)	12 to 28,4 V DC
Output	4-20 mA or 4-20 mA with HART® 3,8 to 20,5 mA useable (meets NAMUR NE 43)
Span	150 to 4900 mm (6 to 192")
Resolution	Analog: 0,01 mA Display: 0,1 cm (inch)
Loop Resistance (see graph at page 8)	550 Ω @ 24 V DC (20,5 mA)
Damping	Adjustable 0-10 s
Diagnostic Alarm	Adjustable 3,6 mA, 22 mA, HOLD last output (3,6 mA is not valid if unit includes both digital display and HART®)
User Interface	3-button keypad and/or HART® communicator
Display	2-line x 8-character LCD
Menu Language	English/Spanish/French/German
Housing Material	IP 67/Aluminium A356T6 (< 0.20 % copper) or Lexan® Thermoplastic
Approvals	ATEX II 1 G Ex ia IIC T4 Ga Other approvals are available, consult factory for more details
Electrical Data	Ui = 28,4 V, Ii = 94 mA, Pi = 0,67 W
Equivalent Data	Ci = 20 nF, Li = 400 μH
Shock/Vibration Class	ANSI/ISA-S71.03 Class SA1 (Shock), ANSI/ISA-S71.03 Class VC2 (Vibration)
Net weight	Aluminium: 1,6 kg (3.5 lbs) – electronics only Lexan®: 0,7 kg (1.5 lbs) – electronics only
Overall Dimensions	Aluminium (blind): H 166 mm (6.54") x W 99 mm (3.90") x Ø 115 mm (4.53") Aluminium (with display): H 175 mm (6.91") x W 99 mm (3.90") x Ø 115 mm (4.53") Lexan®: H 153 mm (6") x W 95 mm (3.75") x Ø 115 mm (4.53")

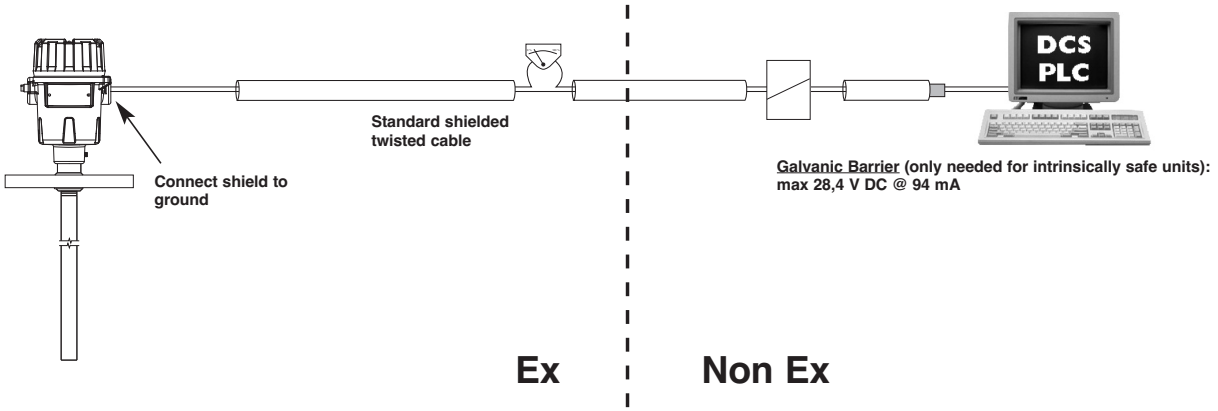
PERFORMANCE

Description	*Specification*
Reference Conditions	Reflection from water at +20 °C (+70 °F) with 183 cm (72") coaxial GWR probe
Linearity	7MR GWR probe: ± 6,3 mm (0,25") 7MB GWR probe: ± 12,7 mm (0,50")
Resolution	± 4 mm (0.15")
Repeatability	< 4 mm (0.15")
Hysteresis	< 4 mm (0.15")
Response Time	< 1 second
Warm-up Time	< 5 seconds
Ambient Temp.	blind transmitters -40 °C to +80 °C (-40 °F to +175 °F) – Aluminium housing -40 °C to +70 °C (-40 °F to +160 °F) – Lexan® housing transmitters with LCD -20 °C to +70 °C (-5 °F to +160 °F)
Process Dielectric Effect	< 13 mm (0.5") within selected range
Operating Temp. Effect	Approx. ± 0,03 % of probe length/°C for probes ≥ 2,5 m (8')
Humidity	0-99 %, non-condensing
Electromagnetic Compatibility	Meets CE requirements (EN-61326: 1997 + A1 + A2) (twin-rod probe must be used in metallic vessel or stillwell)

LOOP RESISTANCE



ELECTRICAL WIRING



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BULLETIN N°: BE 57-104.4
EFFECTIVE: OCTOBER 2013
SUPERSEDES: September 2010

UNDER RESERVE OF MODIFICATIONS

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