

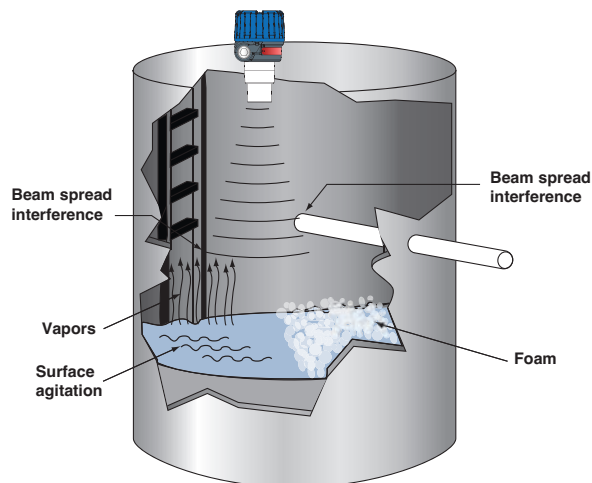
PRINCIPLE OF OPERATION

The level measurement is accomplished by emitting an ultrasonic pulse from the transducer face and measuring the travelling time between sending this pulse and its reflected echo from the liquid surface. Since the speed of sound is temperature dependant, the transducer also measures ambient temperature to compensate for the changing velocity.

Measurement Range Calculations

Ultrasonic non-contact measurement transmitters are typically rated for their maximum rangeability. Depending process conditions, their maximum range needs to be reduced for getting an optimal measuring result. Use below chart to calculate the realistic rangeability of your application.

6 m (20 ft) x Performance multiplier (see table below) as per described process condition.



OPERATING PARAMETER	CONDITION	PERFORMANCE MULTIPLIER
SURFACE AGITATION: Surface agitation or waves can degrade the performance. Moderate agitation results in only slight degradation of performance. The worst case is when the surface is a good reflector, but in the wrong direction.	Smooth, glass-like surface	1.0
	Slight agitation, choppiness	0.9
	Heavy agitation	0.8
	Slight vortex	0.7
VAPORS AND STEAM: Vapors can cause problems when the liquid process temperature is well above the temperature of the airspace. The greater the difference, the more expected vapor problems. The problems result from condensation or layering in the sound path, both of which attenuate the sound signal, and degrade performance. If a vent is used, be sure that it is well away from the transducer.	No condensation	1.0
	Little condensation	0.9
	Much condensation/ foggy appearance	0.8
BEAM SPREAD INTERFERENCE: It is recommended that no obstructions, such as ladder rungs, fill pipes, support struts, etc, be allowed within the 10° ultrasonic beam. If an obstruction is unavoidable, make it as far as possible from the transducer. Interference from agitator blades is only an intermittent interference that usually has little effect on performance. A special software algorithm can also help suppress false echoes from agitator blades that are within the beam angle.	No interference within 5° half beam angle	1.0
	Agitator at speed less than 60 RPM	1.0
	Agitator at speed greater than 60 RPM . Consult factory	
	Interference outside 2°, far from transducer (in bottom third of range)	0.8
	Interference outside 2°, near to transducer (in top third of range)	0.5
FOAM: Foam can attenuate the ultrasound and render the system inoperative. If possible, moving the transducer to an area in the tank where there is less foam will improve the performance. Thick, heavy-density foams can sometimes produce a reflection from the top of the foam. The multipliers shown at right are general guidelines. For further assistance consult the factory.	No foam	1.0
	Light froth, less than 6 mm (0.25") thick	0.8
	Light foam, less than 12 mm (0.5") thick	0.5
	Light foam, more than 25 mm (1") thick	0.1

EXAMPLE: A heavily agitated tank, without condensation, no interference and a light froth on the surface.

$$\text{Max recommended range: } 6 \text{ m} \times 0.8 \times 1.0 \times 1.0 \times 0.8 = 3,84 \text{ m}$$

SELECTION DATA

1. Order code for Echotel 355 transmitter

1 - 5 | BASIC MODEL NUMBER

3 5 5 - 5 1	24 V DC 2-wire loop powered ultrasonic non contact transmitter with HART®
-------------	---

6 7 | ACCESSORIES

0 A	Digital display and keypad
-----	----------------------------

8 | MOUNTING / APPROVAL

1	Integral mount, Weatherproof
A	Integral mount, ATEX intrinsically safe
C	Integral mount, ATEX flameproof enclosure (not available with Lexan® plastic housing)

9 | HOUSING / CABLE ENTRY

0	IP 66, Cast aluminium, 3/4" NPT cable entry (2 entries - 1 plugged)
1	IP 66, Cast aluminium, M20 x 1,5 cable entry (2 entries - 1 plugged)
6	IP 66, Lexan® plastic, 3/4" NPT cable entry (2 entries - 1 plugged)
7	IP 66, Lexan® plastic, M20 x 1,5 cable entry (single entry)

10 | TRANSDUCER

B	60 kHz, Polypropylene, 2" NPT process connection
R	60 kHz, Kynar Flex®, 2" NPT process connection

X	3	5	5	5	1	0	A			
	1	2	3	4	5	6	7	8	9	10

complete order code for Echotel 355 transmitter

X = product with a specific customer requirement.

TRANSMITTER SPECIFICATIONS

FUNCTIONAL/PHYSICAL

Description	Specification
Power (at terminals)	Weatherproof / ATEX flameproof enclosure: 16 to 36 V DC ATEX Intrinsically Safe: 16 to 28,4 V DC
Output	4-20 mA with HART®, 3,8 mA to 20,5 mA useable (meets NAMUR NE 43)
Range	330 mm (13") to 6 m (20') - depending process conditions
Resolution	Analog: 0,01 mA Display: 0,1 cm (inch)
Loop Resistance	400 Ω @ 20 mA - 24 V DC or 350 Ω @ 22 mA - 24 V DC
Damping	Adjustable 0-60 s
Diagnostic Alarm	Adjustable 3,6 mA, 22 mA, HOLD last output
User Interface	HART® communicator, PACTware® and/or 4-button keypad
Display	2-line x 16-character LCD
Menu Language	English/Spanish/French/German
Housing Material	IP 66/Aluminium A356T6 (< 0.20 % copper) or Lexan® Thermoplastic
Approvals	ATEX II 1 G Ex ia IIC T4, intrinsically safe ATEX II 1/2 G Ex ma / d IIC T6, flameproof enclosure Other approvals are available, consult factory for more details
SIL (Safety Integrity Level)	Functional safety to SIL 1 as 1oo1 in accordance to IEC 61508 – SFF of 88,5 %
Electrical Data	Ui = 28,4 V, li = 94 mA, Pi = 0,67 W // Ui = 28 V, li = 120 mA, Pi = 0,84 W
Equivalent Data	Ci = 5,5 nF, Li = 370 μH
Shock/Vibration Class	ANSI/ISA-S71.03 SA1 (Shock), ANSI/ISA-S71.03 VC2 (Vibration)
Net Weight	Cast aluminium 1,45 kg (3,2 lbs) incl. Kynar Flex® transducer Lexan® 0,73 kg (1,6 lbs) incl. Polypropylene® transducer
Overall Dimensions	H 186 mm (7.31") x W 101 mm (3.98") - cast alu H 166 mm (6.53") x W 96 mm (3.78") - Lexan®

