

## ECHOTEL® 355

Ultrasonic non contact transmitter for level, volume or open channel flow

### DESCRIPTION

The Echotel® 355 is an integral mount, high performance ultrasonic non contact transmitter for liquid level, volume and open channel flow measurement.

The electronics are housed in a single compartment cast aluminium or Lexan® housing. The intelligent electronics analyze the ultrasonic echo profile, apply temperature compensation, reject echoes from false targets, and then processes the true echo from the liquid surface. This results in an extremely reliable measurement even when application difficulties like turbulence and false echoes exist.

### FEATURES

- 2-wire, intrinsically safe loop powered
- Fast and easy configuration via 2 x 16 character display and 4-pushbutton keypad
- False target rejection identifies true echo from liquid surface
- Common tank shapes and 20-point custom table for volume calculations.
- Flume/weir primary elements and generic equation for open channel flow.
- Two 7-digit totalizers for flow:
  - resettable
  - continuous totalizer

### APPLICATIONS

- Open channel flow flumes and weirs
- Paint, ink and solvent tanks
- Chemical storage
- Thick and viscous media
- Batch and day tanks

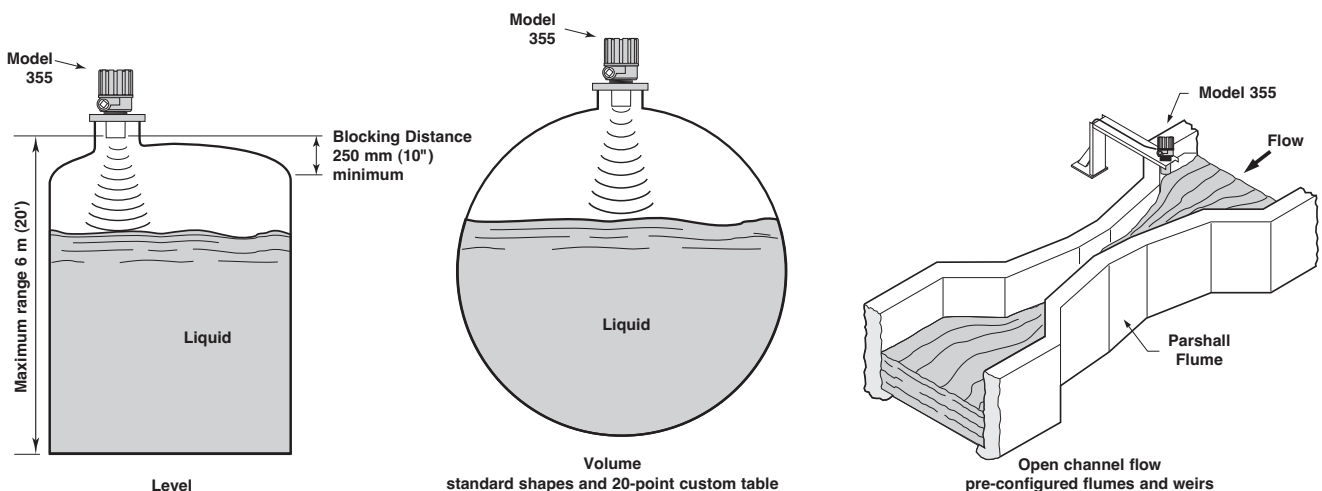
### Up to 6 m (20 ft) range



### AGENCY APPROVALS

| Agency            | Approvals   |
|-------------------|---|
| ATEX<br>Ex        | II 1 G Ex ia IIC T4, intrinsically safe<br>II 1/2 G Ex ma / d IIC T6, explosion proof |
| FM US<br>APPROVED | Non Incendive and I.S.  |

① Consult factory for proper part numbers.



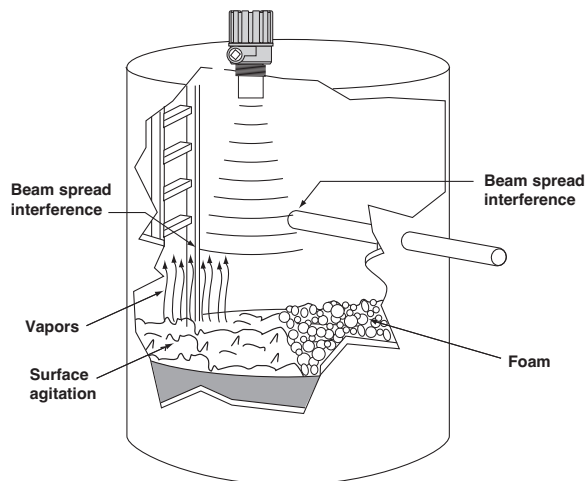
## PRINCIPLE OF OPERATION

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 |
|--|---|------------------------|
| <b>SURFACE AGITATION:</b> 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, chopiness   | 0.9                    |
|  | Heavy agitation   | 0.8                    |
|  | Slight vortex   | 0.7                    |
| <b>VAPORS AND STEAM:</b> 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                    |
| <b>BEAM SPREAD INTERFERENCE:</b> 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                    |
| <b>FOAM:</b> 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.

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

## EXPEDITE SHIP PLAN (ESP)

Several models are available for quick shipment, within max. 4 weeks after factory receipt of purchase order, through the Expedite Ship Plan (ESP).

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

To take advantage of ESP, simply match the colour grey 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

## 1. Order code for Echotel 355 transmitter

### BASIC MODEL NUMBER

|             |  |
|-------------|--|
| 3 5 5 - 5 1 | 24 V DC 2-wire loop powered ultrasonic non contact transmitter with HART®    |
| 3 5 5 - 5 0 | 24 V DC 2-wire loop powered ultrasonic non contact transmitter without HART® |

### ACCESSORIES

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

### MOUNTING / APPROVAL

|   |  |
|---|--|
| 1 | Integral mount, Weatherproof   |
| A | Integral mount, ATEX intrinsically safe  |
| C | Integral mount, ATEX explosion proof (not available with Lexan® plastic housing) |

### 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)          |

### TRANSDUCER

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

|  |   |   |   |   |   |   |  |  |  |
|--|---|---|---|---|---|---|--|--|--|
|  | 3 | 5 | 5 | 5 | 0 | A |  |  |  |
|--|---|---|---|---|---|---|--|--|--|

**complete order code for Echotel 355 transmitter**

→ X = if there are any deviations from a standard part number

## TRANSMITTER SPECIFICATIONS

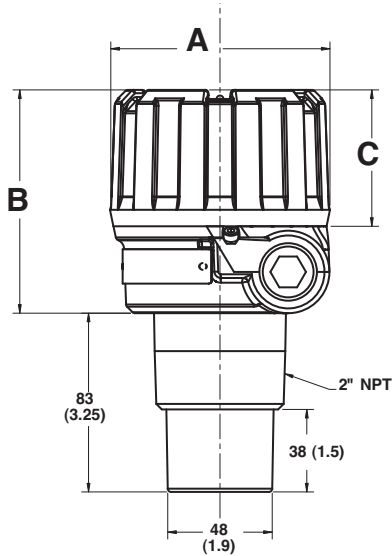
### FUNCTIONAL/PHYSICAL

| Description                  | Specification  |   |
|------------------------------|--|---|
| Power (at terminals)         | Weatherproof / ATEX explosion proof: 16 to 36 V DC<br>ATEX Intrinsically Safe: 16 to 28,4 V DC   |   |
| Output                       | 4-20 mA or 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<br>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<br>ATEX II 1/2 G Ex ma / d IIC T6, explosion proof<br>cFMus, Non incendive and intrinsically safe |   |
| 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<br>H 166 mm (6.53") x W 96 mm (3.78") - Lexan®  |   |

**PERFORMANCE**

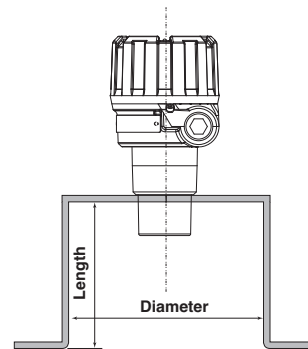
| Description                   | Specification   |
|-------------------------------|---|
| Linearity                     | ± 10 mm (0,4")  |
| Accuracy                      | ± 0,2 % of full span or 6 mm (0.24"), whichever is greater  |
| Blocking distance             | 250 mm (10")  |
| Resolution                    | ± 2,5 mm (0.1")   |
| Repeatability                 | ± 3 mm (0.125")   |
| Response time                 | < 1 second  |
| Warm-up time                  | 30 seconds  |
| Ambient temp.                 | -40 °C to +70 °C (-40 °F to +160 °F) (weatherproof upto +80 °C (+175 °F))<br>Display: -20 °C to +70 °C (-5 °F to +160 °F) |
| Humidity                      | 0-99 %, non-condensing  |
| Process temp.                 | -40 °C to +80 °C (-40 °F to +175 °F)  |
| Process pressure              | max 3 bar (43.5 psi)  |
| Electromagnetic compatibility | Meets CE requirements (EN 61326: 1997 + A1 + A2)  |

**DIMENSIONS in mm (inch)**



The inside of the nozzle should be smooth. The inner rim at the end of the nozzle must be smooth and free of burrs.

| Standpipe Ø | Max Length   |
|-------------|--------------|
| 2" (50 mm)  | not recom.   |
| 3" (75 mm)  | 225 mm (9")  |
| 4" (100 mm) | 300 mm (12") |
| 5" (125 mm) | 375 mm (15") |
| 6" (150 mm) | 450 mm (18") |
| 8" (200 mm) | 500 mm (20") |



| Housing        | A          | B          | C         |
|----------------|------------|------------|-----------|
| Cast Aluminium | 101 (3.99) | 103 (4.06) | 63 (2.48) |
| Lexan® plastic | 96 (3.78)  | 83 (3.25)  | 42 (1.65) |



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UNDER RESERVE OF MODIFICATIONS

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|-------------------|--|
| BENELUX<br>FRANCE | Heikensstraat 6, 9240 Zele, België -Belgique<br>Tel. +32 (0)52.45.11.11 • Fax. +32 (0)52.45.09.93 • E-Mail: info@magnetrol.be                                      |
| DEUTSCHLAND       | Alte Ziegelei 2-4, D-51491 Overath<br>Tel. +49 (0)2204 / 9536-0 • Fax. +49 (0)2204 / 9536-53 • E-Mail: vertrieb@magnetrol.de                                       |
| INDIA             | C-20 Community Centre, Janakpuri, New Delhi - 110 0058<br>Tel. +91 (11) 41661840 • Fax +91 (11) 41661843 • E-Mail: info@magnetrolindia.com                         |
| ITALIA            | Via Arese 12, I-20159 Milano<br>Tel. +39 02 607.22.98 (R.A.) • Fax. +39 02 668.66.52 • E-Mail: mit.gen@magnetrol.it  |
| U.A.E.            | DAFZA Office 5EA 722 • PO Box 293671 • Dubai<br>Tel. +971-4-6091735 • Fax +971-4-6091736 • E-Mail: info@magnetrol.ae   |
| UNITED<br>KINGDOM | Unit 1 Regent Business Centre, Jubilee Road Burgess Hill West Sussex RH 15 9TL<br>Tel. +44 (0)1444 871313 • Fax +44 (0)1444 871317 • E-Mail: sales@magnetrol.co.uk |

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