

Data Sheet

MAGNETROL MODEL R82 NON CONTACT RADAR TRANSMITTER



Supplied by

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MODEL R82

Non contact radar transmitter
for level and volume

DESCRIPTION

The Model R82 is an economical, loop powered radar transmitter bringing radar to everyday applications. Ultrasonic devices, frequently used in daily applications, can now be replaced using radar technology with its superior performance.

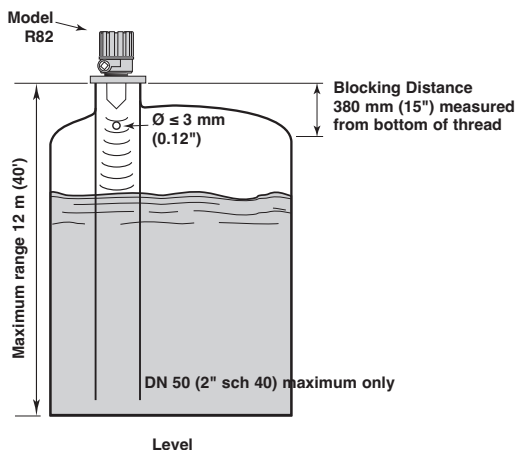
The electronics are housed in a single compartment cast aluminium or polycarbonate housing. The R82 measures effectively even when atmospheres above the liquid are saturated with vapour. Pulse Burst technology and advanced signal processing manage common disturbances such as false echoes caused by obstructions, multi-path reflections from tank sidewalls or turbulence caused by agitators, aggressive chemicals, or aerators.

FEATURES

- 2-wire loop powered intrinsically safe transmitter
- 26 GHz frequency
- Fast and easy configuration via 2-line x 16 characters display and 4-button keypad
- Intuitive false target profiling
- Rotatable microwave beam for optimized operation
- Encapsulated PP or ETFE antennas in lengths of 50 mm (2") and 200 mm (8")
- Process
 - temperature: -40 °C to +95 °C (-40 °F to +200 °F)
 - pressure: vacuum to 13,8 bar (200 psi)
 - dielectric: 1,7 – 100
- Suited for SIL 1 loops (full FMEDA report available)
- Tracking of high rates of level change up to 4.5 m/min (180"/min)

APPLICATIONS

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



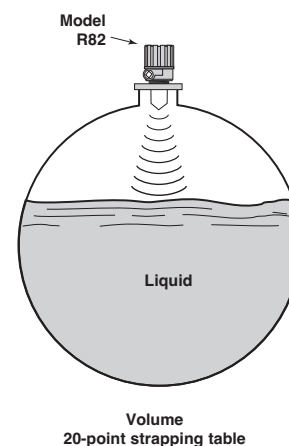
Up to 12 m (40 ft) range



AGENCY APPROVALS

| Agency | Approval |
|-----------------------------------------------------------------|-----------------------------------------|
| ATEX | II 1 G Ex ia IIC T4, intrinsically safe |
| IECEX | Ex ia IIC T4 Ga |
| cFMus ^① | |
| Russian Authorisation Standards ^① | |
| Other approvals are available, consult factory for more details | |

^① Consult factory for proper model numbers and classifications.



PRINCIPLE OF OPERATION

Model R82 Pulse Burst Radar emits short bursts of 26 GHz energy to a liquid surface. An ultra-high-speed timing circuitry measures the time of the signal reflected off the liquid surface.

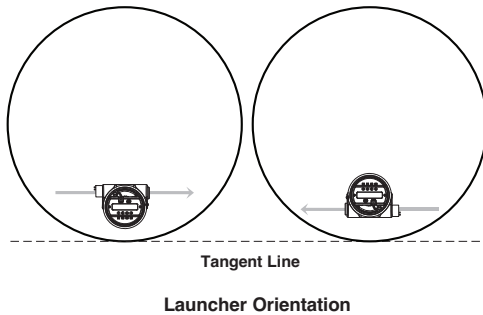
Sophisticated signal processing filters out false reflections and other background noises. The exact level is then calculated, by factoring tank height and sensor offset information. The Model R82 circuitry is extremely energy efficient so no duty cycling is needed like with likewise radars. This allows to track high rates of level changes up to 4,5 m/minute (180"/min).

ORIENTATION

The R82 transmitter utilizes a linearly polarized, microwave beam that can be rotated to improve its performance. Proper orientation can minimize unwanted target reflections (multipath) and maximize direct reflections from the liquid surface. The polarization pattern is parallel to the transmitter display when the mechanism is at the #11 position. Each index number represents 10 degrees of rotation.

In a typical vertical tank, the launcher should be adjusted so the polarization pattern is parallel to a line tangent to the nearest tank wall.

For horizontal cylindrical vessels aim beam down the long axis of the vessel.



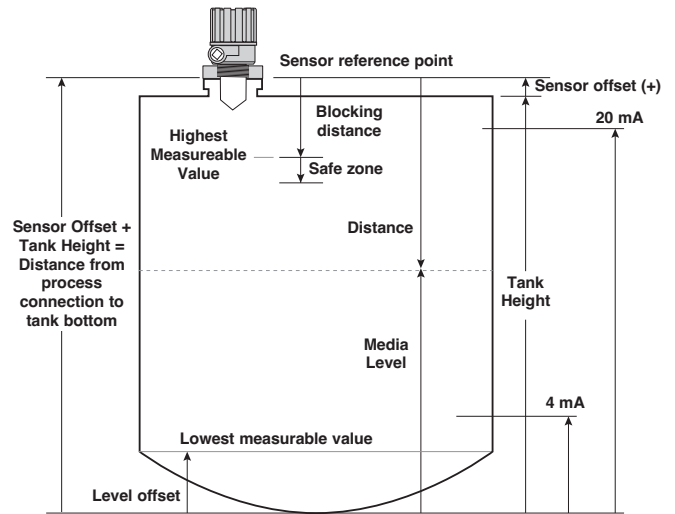
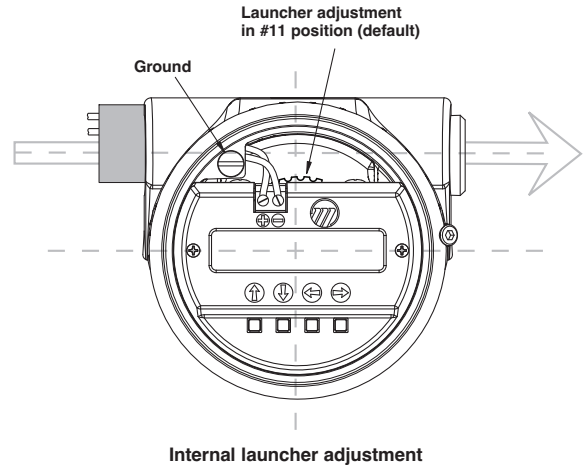
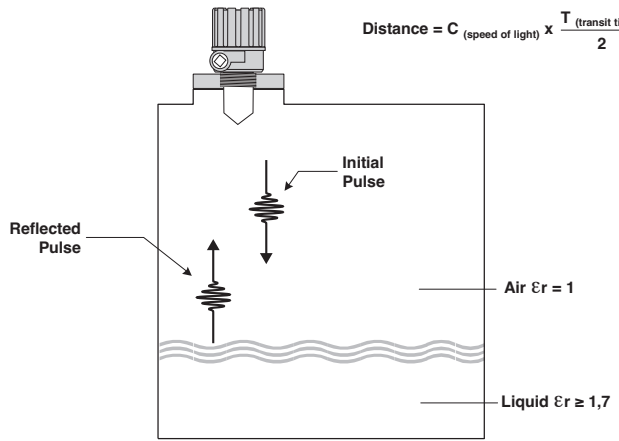
OPERATIONAL CONSIDERATIONS

Radar applications are characterized by three basic conditions:

- Dielectric
- Distance (measuring range)
- Disturbances (turbulence, foam, false targets, multiple reflections and rate of change)

Maximum measuring range (distance) is calculated as Tank Height + Sensor Offset. It is measured from the sensor reference point (bottom of NPT thread, top of BSP thread, or face of flange). The maximum distance chart shows the maximum measuring range of each antenna based on dielectric and turbulence.

$$\text{Distance} = C \text{ (speed of light)} \times \frac{T \text{ (transit time)}}{2}$$



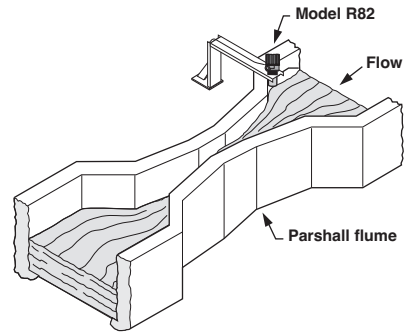
| Turbulence | Wave height in mm (inch) | Maximum distance in m (ft) | | |
|------------|--------------------------|----------------------------|----------------|----------------|
| | | εr: 1,7 - 3,0 | εr: 3,0 - 10,0 | εr: 10,0 - 100 |
| None | – | 7,9 (26) | 10,1 (33) | 12 (40) |
| Light | < 12,7 (0.5) | 6,4 (21) | 7,9 (26) | 9,8 (32) |
| Moderate | 12,7 - 25,4 (0.5 - 1.0) | 4,3 (14) | 5,8 (19) | 7,3 (24) |
| Heavy | > 25,4 (1.0) | 2,1 (7) | 3,7 (12) | 5,2 (17) |

OPEN CHANNEL FLOW APPLICATIONS

EXTENSIVE SELECTION OF PRIMARY FLOW ELEMENTS

With a total of 35 flume and weir curves stored in the electronics, it would be hard to find an open channel flow application that cannot be handled by the R82 transmitter. Unusual flow applications can readily be accomplished through the use of either the 20-point custom table or the generic discharge flow equation which allows a direct entry of unique flow equations.

$$Q=K(L-CH)H^n$$



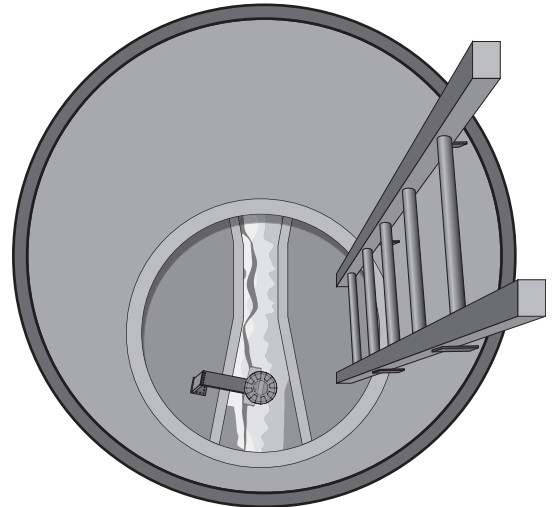
DUAL FLOW TOTALIZERS

Two 7-digit flow totalizers are provided for recording flow in cubic feet, gallons, million gallons, liters, million liters, or cubic meters. One totalizer is resettable and the other is non-resettable. Several multipliers are selectable to allow for proper scaling. Totalizer time is also recorded to show how long each totalizer has been recording flow.

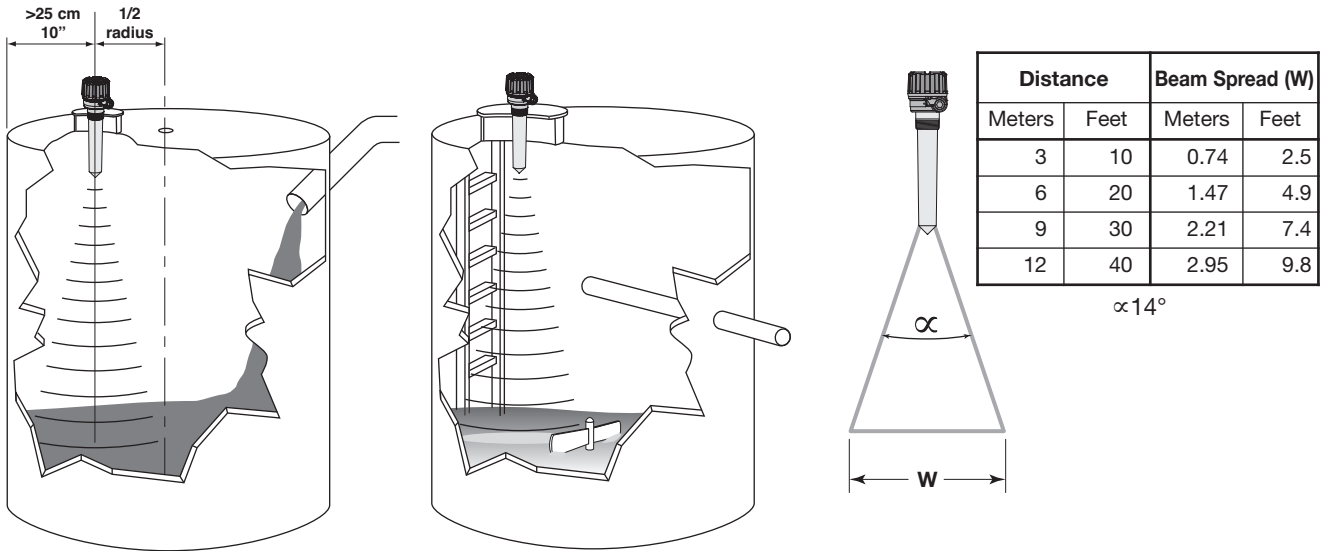
ENCLOSED FLUMES AND WEIRS

Conditions: turbulence and changing dielectric.

NOTE: For optimal accuracy, mount the transmitter a minimum of 75 cm (30") above the flow element (this is dependent on type and size of the flow element). Consult factory for assistance on this dimension.



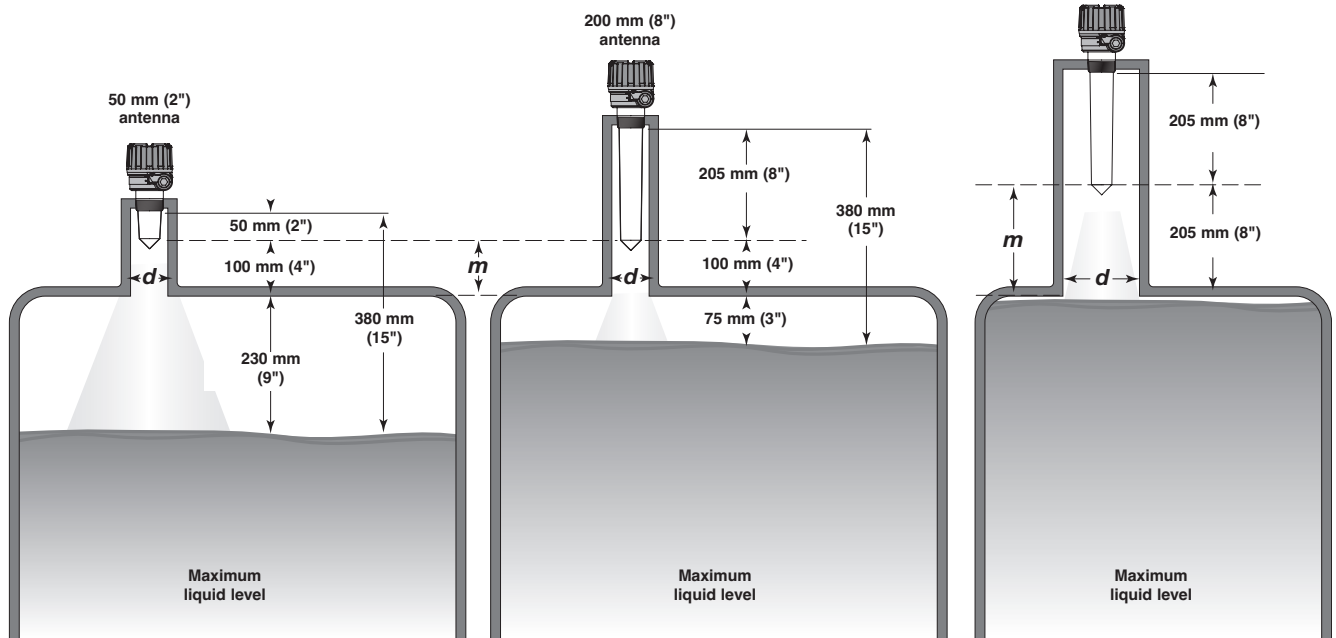
MOUNTING



Maximum recess (m) is 2 x nozzle diameter (d) (Sch. 40 maximum)

example: 50 mm (2") diameter nozzle

example: 100 mm (4") diameter nozzle

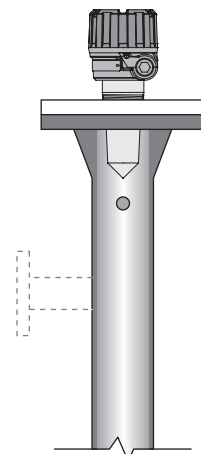


Maximizing useable capacity

STANDPIPES, STILLWELLS AND BRIDLES

The R82 can be mounted in a standpipe or stillwell but certain considerations should be given:

- Metal stillwells only: DN 50 (2" sch 40) maximum only.
- Diameter must be consistent throughout length; no reducers.
- Stillwell length must cover complete range of measurement (i.e., liquid must be in stillwell).
- Welds should be smooth.
- Vents: holes $< 3\text{ mm}$ (0.125") diameter, slots $< 3\text{ mm}$ (0.125") width.
- If an isolation valve is used, it must be a full-port ball valve with an I.D. equal to the pipe diameter.
- Bridles/Bypass installations: the launcher adjustment (#11 position, default) should be rotated 90° from process connections.
- Configuration must include an entry for PIPE I.D.



TRANSMITTER SPECIFICATIONS

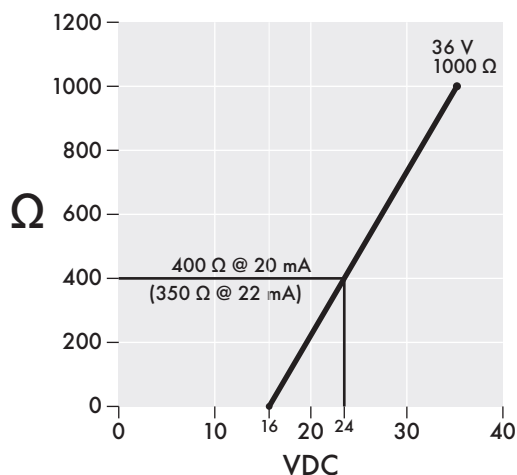
FUNCTIONAL/PHYSICAL

| Description | Specification |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power (at terminals) | Weatherproof: 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) |
| Span | 380 mm (15") to 12 m (40') - depending process conditions and measured from thread |
| Resolution | Analog: 0,01 mA Display: 0,1 cm (0,1 inch) |
| Loop Resistance | 400 Ω @ 20 mA - 24 V DC or 350 Ω @ 22 mA - 24 V DC |
| Damping | Adjustable 0-45 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 display |
| Menu Language | English/Spanish/French/German |
| Housing Material | IP 66 / Aluminium A356T6 (< 0.20 % copper) or IP 67 / polycarbonate |
| Approvals | ATEX II 1 G Ex ia IIC T4 / IEC Ex ia IIC T4 Ga, intrinsically safe 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 89,1 % |
| 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 |
| | Polycarbonate |
| Overall Dimensions | Max: H 376 mm (14.80") x W 101 mm (3.98") - cast alu housing and tall sensor Min: H 204 mm (8.03") x W 96 mm (3.78") - polycarbonate housing and short sensor |

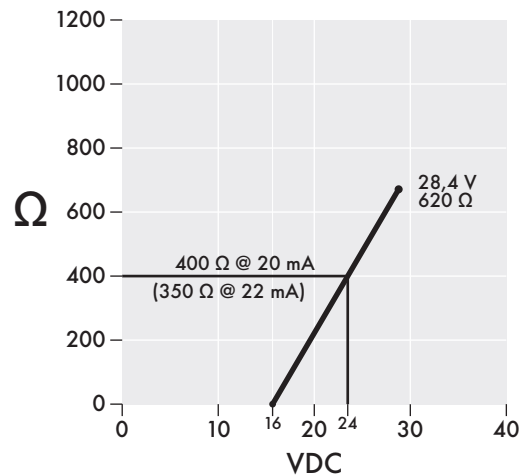
PERFORMANCE

| Description | Specification |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Linearity | ± 5 mm (0,2") or 0,05 % of tank height, whichever is greater |
| Measured error | ± 5 mm (0,2") or 0,05 % of tank height, whichever is greater. Within 1,5 m (60") of antenna threads, performance will begin degrading, reaching ± 2 cm (0,8") within 38 cm (15"). |
| Blocking distance | 380 mm (15"), measured from bottom of thread and independent from antenna type |
| Resolution | 2,5 mm (0,1") |
| Repeatability | < 2,5 mm (0,1") or 0,025 % of tank height |
| Response time | < 1 second |
| Warm-up time | 30 seconds |
| Ambient temp. | -40 °C to +70 °C (-40 °F to +160 °F) (weatherproof up to +80 °C (+175 °F)) Display: -20 °C to +70 °C (-5 °F to +160 °F) |
| Humidity | 0-99 %, non-condensing |
| Dielectric range | 1,7 - 100 |
| Process temp. | -40 °C to +95 °C (-40 °F to +200 °F) |
| Process pressure | Full vacuum up to 13,8 bar (200 psi) |
| Electromagnetic compatibility | Meets CE requirements (EN 61326: 1997 + A1 + A2 / EN 50081-2 / EN50082-2) |

LOOP RESISTANCE

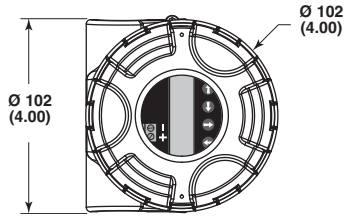


Weatherproof

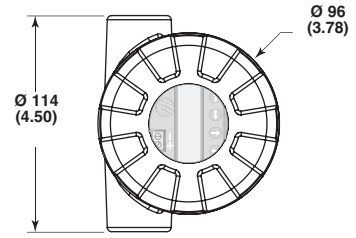


Intrinsically safe

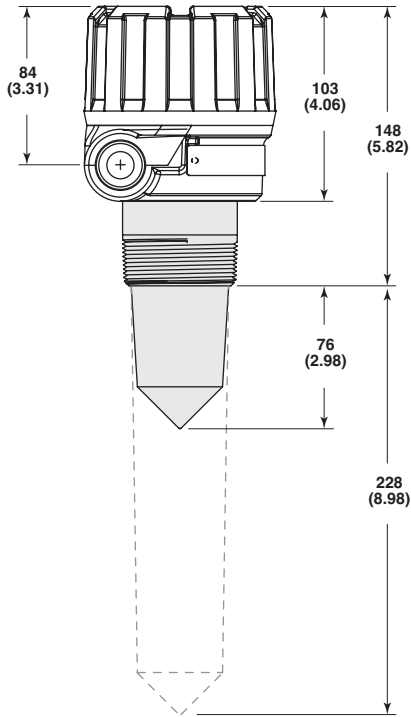
DIMENSIONS IN mm (inch)



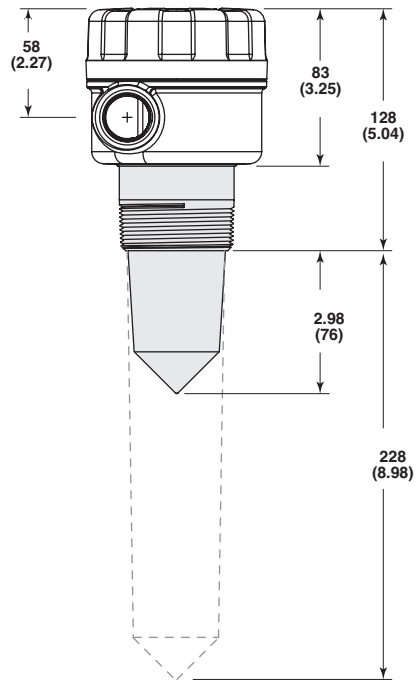
Aluminium housing
Top view



Polycarbonate housing
Top view



Aluminium housing
Side view



Polycarbonate housing
Side view

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 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 five 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 Model R82 transmitter

BASIC MODEL NUMBER

| | |
|-----------|----------------------------------------------------------------------|
| R 8 2 - 5 | 24 V DC 2-wire loop powered non contact radar transmitter with HART® |
|-----------|----------------------------------------------------------------------|

MOUNTING / APPROVAL

| | |
|---|------------------------------------------------|
| A | Integral mount, Weatherproof |
| B | Integral mount, ATEX/IEC Ex intrinsically safe |

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 67, polycarbonate plastic, 3/4" NPT cable entry (2 entries - 1 plugged) |
| 7 | IP 67, polycarbonate plastic, M20 x 1,5 cable entry (single entry) |

ACCESSORIES

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

ANTENNA TYPE

| | |
|-----|--------------------------------------------------|
| 0 1 | Polypropylene antenna with 50 mm (2") extension |
| 0 2 | Polypropylene antenna with 200 mm (8") extension |
| 0 3 | ETFE antenna with 50 mm (2") extension |
| 0 4 | ETFE antenna with 200 mm (8") extension |

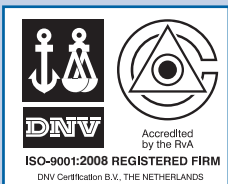
PROCESS CONNECTION – SIZE/TYPE

| | | |
|---|------------------------|-----------------------|
| 1 | Threaded 2" NPT | – Schedule 40 maximum |
| 2 | Threaded 2" BSP (G 2") | – Schedule 40 maximum |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|--|--|---|---|---|--|--|
| X | R | 8 | 2 | - | 5 | | | A | - | 0 | | |
|---|---|---|---|---|---|--|--|---|---|---|--|--|

complete order code for Model R82 transmitter

→ X = product with a specific customer requirement



QUALITY ASSURANCE - ISO 9001:2008

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 9001:2008** AND OUR TOTAL COMPANY IS COMMITTED TO PROVIDING FULL CUSTOMER SATISFACTION BOTH IN QUALITY PRODUCTS AND QUALITY SERVICE.

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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.



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SUPERSEDES: September 2010

UNDER RESERVE OF MODIFICATIONS

| | |
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