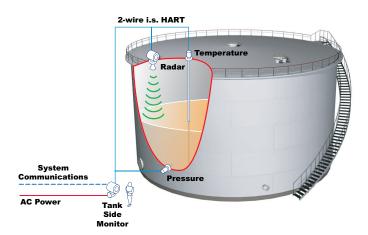
# **FMR60 Radar Tank Gauge**

Smart 80 GHz radar tank gauge for continuous and non-contact level measurement with an accuracy rate of  $\pm 1$  mm

# Highlights

- 2-wire technology: Reduces on tank wiring costs and allows easy implementation into existing systems.
- Non-contact measurement: Tank top is almost independent from product properties.
- 2"/50 mm PTFE drip-off antenna.
- Standard range to 164 ft (50 m).
- Easy onsite operation using built-in touch control display without opening enclosure (or optional push button display with cover removed).
- Access historic data from device integrated memory (HistoROM) and transfer configuration setting from device to device.
- Easy commissioning and diagnostics using Windows<sup>®</sup> based software.
- HART protocol.
- High temperatures: Suitable for process temperatures from -40° C (-40° F), up to 130° C (266° F) with high-temperature antenna.
- Pressure: -1 to +16 bar (-14.5 to +232 psi)
- Approved for use in explosive hazardous locations.
- Optional: Integrated over voltage protection.
- SIL 2 approved for overspill protection system applications or SIL 3 for standalone applications.
- Optional remote display (FHX50).
- Bluetooth<sup>®</sup> wireless technology for commissioning, operation, and maintenance via free iOS/Android app SmartBlue, with optional BT10 Bluetooth module



Example tank gauging system using the 4590 Tank Side Monitor and NMT532/ NMT539 Average Temperature Converter



## **Product Options**

#### **Approvals & Certifications**

• FM, CSA, ATEX, IECEx, NEPSi, KC, INMETRO, JPN, and TIIS

#### Antenna & Seals

- Drip-off, PTFE 50mm/2" antenna
- Seal: FKM Viton GLT (-40...80° C/-40...176° F or 40...130° C/-40...266° F) and EPDM (-40...130° C/-40...266° F)

### **Process Connections**

- Threaded ISO0228 G1-1/2", 316L
- Thread ANSI MNPT1-1/2", 316L
- PP or 316L UNI flange 3"/DN80/80, max 4bar abs/58psia, suitable for NPS 3" Cl.150/DN80 PN16/10K 80
- PP or 316L UNI flange 4"/DN100/100, max 4bar abs/58psia, suitable for NPS 4" Cl.150/DN100 PN16/10K 100
- PP or 316L UNI flange 6"/DN150/150, max 4bar abs/58psia, suitable for NPS 6" Cl.150/DN150 PN16/10K 150

#### **Output Options**

- HART
- Gland Entry
- Metric, NPT, G

Languages

• Over 15 national languages available

## **Technical Specifications**

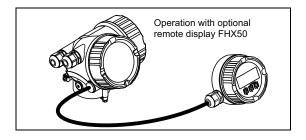
**Note!** This product conforms to all applicable industry standards and approvals, such as climate class, electromagnetic (EMC), vibration and radio frequency (RF). See product installation manual.

**Note!** These specifications apply to the FMR60 under reference operating conditions (DIN EN IEC 61298-2 / DIN EN IEC 60770-1) with no major interference reflections inside the signal beam.

- Temperature = +24 °C (+75 °F) ±5° F (±9° C)
- Pressure = 960 mbar abs. (14 psia) ±100 mbar (±1.45 psi)
- Humidity = 60% ±15%
- Reflector: metal plate with a minimum diameter of 1 m (40 in)
- No major interference reflections inside the signal beam

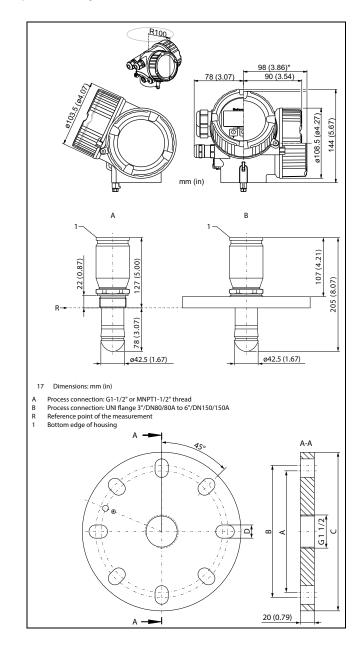
Reference Accuracy       Measuring distance up to 0.8 m (2.62 ft): max. ±4 mm (±0.16 in) - digital, ±0.03% analog Measuring distance > 0.8 m (2.62 ft): ±1 mm (±0.04 in), digital, ±0.02% analog         Power Consumption       - 2-wire; 4-20mA HART; switch output: < 0.9 W         2-wire; 4-20mA HART, switch output:          0.7 W         Current Consumption         HART: Nominal current: 3.6 to 22mA. The start-up current for multidrop mode can be parametrized (is set to 3.6mA on delivery)         Breakdown signal (NAMUR NE43): adjustable: 3.59 to 22.5mA         Weight       3.2 - 3.9 kg (7.11 - 8.61 lb) plus flange weight         Enclosure       Degree of protection: - PF8, NEMA6P (24 h at 1.83 m under water surface) - PF6r NBA4X         Obgen housing: IP20, NEMA1 - Display module: IP22, NEMA2 - Housing GT19: plastic - Housing GT20: aluminium, seawater repellent, powder coated         Antenna       IP 68 (NEMA 6P)         Conduit Entries       Gland M20; Materi		
Power Consumption <ul> <li>2-wire; 4-20mA HART; &lt; 0.9 W</li> <li>2-wire; 4-20mA HART, switch output: &lt; 0.9 W</li> <li>2-wire; 4-20mA HART, switch output: &lt; 0.9 W</li> <li>2-wire; 4-20mA HART, switch output: &lt; 0.9 W</li> <li>2-wire; 4-20mA HART, 4-20mA: &lt; 2 x</li> <li>0.7 W</li> </ul> <li>Current Consumption</li> <li>HART:         <ul> <li>Nominal current: 3.6 to 22mA. The start-up current for multidrop mode can be parametrized (is set to 3.6mA on delivery)</li> <li>Breakdown signal (NAMUR NE43): adjustable: 3.59 to 22.5mA</li> </ul> </li> <li>Weight</li> <li>3.2 - 3.9 kg (7.11 - 8.61 lb) plus flange weight</li> <li>Enclosure</li> <li>Degree of protection:         <ul> <li>• With closed housing tested according to:</li></ul></li>	Reference Accuracy	mm (±0.16 in) - digital, ±0.03% analog Measuring distance > 0.8 m (2.62 ft): ±1 mm (±0.04
• 2-wire; 4-20mA HART, switch output: <         0.9 W         • 2-wire; 4-20mA HART, 4-20mA: < 2 x         0.7 W         Current Consumption         HART:         Nominal current: 3.6 to 22mA. The start-up current for multidrop mode can be parametrized (is set to 3.6mA on delivery)         Breakdown signal (NAMUR NE43): adjustable: 3.59 to 22.5mA         Weight       3.2 - 3.9 kg (7.11 - 8.61 lb) plus flange weight         Enclosure       Degree of protection: • With closed housing tested according to: - IP68, NEMA6P (24 h at 1.83 m under water surface) - For plastic housing with transparent cover (display module): IP68 (24 h at 1.00 m under water surface) - IP66, NEMA4X • With open housing: IP20, NEMA1 • Display module: IP22, NEMA2 • Housing GT20: aluminium, seawater repellent, powder coated         Antenna       IP 68 (NEMA 6P)         Conduit Entries       Gland M20; Material dependent on the approval: - For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic: Plastics M20A1.5 for cable a7 to 10 mm (0.28 to 0.39 in) 1) - For Ex d: No gland available         Thread - %" NPT - G %" - ONI2 valiable for Non-Ex, Ex ic, Ex ia         Ambient Temperature       Unit: -40 "F and +176 "F (-40 "C and +80 "C) Display: 4" F and +176 "F (-40 "C and +70 "C)         Operating Frequency <th></th> <th>Non-repeatability - ≤ 1 mm (0.04 in)</th>		Non-repeatability - ≤ 1 mm (0.04 in)
Nominal current: 3.6 to 22mA. The start-up current for multidrop mode can be parametrized (is set to 3.6mA on delivery)Breakdown signal (NAMUR NE43): adjustable: 3.59 to 22.5mAWeight3.2 - 3.9 kg (7.11 - 8.61 lb) plus flange weightEnclosureDegree of protection: • With closed housing tested according to: - IP68, NEMA&F (24 h at 1.83 m under water surface) - For plastic housing with transparent cover (display module): IP68 (24h at 1.00 m under water surface) - IP66, NEMAAX • With open housing: IP20, NEMA1 • Display module: IP22, NEMA2 • Housing GT19 : plastic • Housing GT20: aluminium, seawater repellent, powder coatedAntennaIP 68 (NEMA6 6P)Conduit EntriesGland M20; Material dependent on the approval: - For Non-Ex, ATEX, IECEX, NEPSI Ex ia/ic: Plastics M20X1.5 for cable ≈5 to 10 mm (0.2 to 0.39 in) - For Dust-Ex, FM IS, CSA GP, Ex nA: Metal M20X1.5 for cable ≈7 to 10 mm (0.28 to 0.39 in) 1) - For Ex d: No gland availableThread - ½" NPT - G ½" - M120 × 1.5Thread - ½" NPT - G ½" - Only available for Non-Ex, Ex ic, Ex iaAmbient TemperatureUnit: -40 "F and +176 "F (-40 "C and +80 "C) Display: -4 "F and +158 "F (-20 "C and +70 "C)Operating FrequencyApprox.80 GHz, up to 8 devices can be installed in the same tankDielectric ConstantsA0 - 1.2 to 1.4 - Butane, liquid nitrogen, liquefied hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis	Power Consumption	<ul> <li>2-wire; 4-20mA HART, switch output: &lt;         <ul> <li>0.9 W</li> <li>2-wire; 4-20mA HART, 4-20mA: &lt; 2 x</li> </ul> </li> </ul>
Weight3.2 - 3.9 kg (7.11 - 8.61 lb) plus flange weightEnclosureDegree of protection: • With closed housing tested according to: • IP68, NEMA6P (24 h at 1.83 m under water surface) • For plastic housing with transparent cover (display module): IP68 (24h at 1.00 m under water surface) • IP66, NEMA4X • With open housing: IP20, NEMA1 • Display module: IP22, NEMA2 • Housing GT19: plastic • Housing GT20: aluminium, seawater repellent, powder coatedAntennaIP 68 (NEMA 6P)Conduit EntriesGland M20; Material dependent on the approval: • For Non-Ex, XTEX, IECEx, NEPSI Ex ia/ic: Plastics M20X1.5 for cable $\approx$ 5 to 10 mm (0.2 to 0.39 in) • For Dust-Ex, FMIS, CSA (S, CSA 6P, Ex nA: Metal M20X1.5 for cable $\approx$ 5 to 10 mm (0.28 to 0.39 in) 1) • For Ex d: No gland availableAmbient TemperatureUnit: -40 "F and +176 "F (-40 "C and +80 "C) Display: -4 "F and +176 "F (-20 "C and +70 "C)Operating FrequencyApprox. 80 GHz, up to 8 devices can be installed in the same tank.Dielectric ConstantsA0 - 1.2 to 1.4 - Butane, liquid nitrogen, liquefied hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. benzene, oil, tolue-e, etc C - 4 to 10 - e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, etc D -> 10 - conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis	Current Consumption	Nominal current: 3.6 to 22mA. The start-up current for multidrop mode can be parametrized (is set to 3.6mA on delivery) Breakdown signal (NAMUR NE43): adjustable: 3.59
CDegree of protection: • With closed housing tested according to: - IP68, NEMA6P (24 h at 1.83 m under water surface) - For plastic housing with transparent cover (display module): IP68 (24h at 1.00 m under water surface) - IP66, NEMA4X • With open housing: IP20, NEMA1 • Display module: IP22, NEMA2 • Housing GT19 : plastic 	Mr. 1. L1	
<ul> <li>With closed housing tested according to:         <ul> <li>- IP68, NEMA6P (24 h at 1.83 m under water surface)</li> <li>- For plastic housing with transparent cover (display module): IP66 (24 h at 1.00 m under water surface)</li> <li>- IP66, NEMA4X</li> <li>With open housing: IP20, NEMA1</li> <li>Display module: IP22, NEMA2</li> <li>- Housing GT19: plastic</li> <li>- Housing GT20: aluminium, seawater repellent, powder coated</li> </ul> </li> <li>Antenna IP 68 (NEMA 6P)</li> <li>Conduit Entries</li> <li>Gland M20; Material dependent on the approval:             <ul> <li>- For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic: Plastics M20x1.5 for cable ø5 to 10 mm (0.2 to 0.39 in)</li> <li>- For Dust-Ex, FM IS, CSA IS, CSA GP, Ex nA: Metal M20x1.5 for cable ø7 to 10 mm (0.2 to 0.39 in) 1)</li> <li>- For Ex d: No gland available</li> </ul> </li> <li>Thread         <ul> <li>- WINPT</li> <li>- G %"</li> <li>- Only available for Non-Ex, Ex ic, Ex ia</li> </ul> </li> <li>Ambient Temperature</li> <li>Unit: -40 °F and +176 °F (-40 °C and +80 °C) Display: -4 °F and +178 °F (-20 °C and +70 °C)</li> <li>Operating Frequency</li> <li>Approx. 80 GHz, up to 8 devices can be installed in the same tank</li> </ul> <li>Dielectric Constants         <ul> <li>A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas</li> <li>- 1.9 to 4 - non-conducting liquids, e.g. liquefied gas</li> <li>- 1.9 to 4 - non-conducting liquids, e.g. liquefied gas</li> <li>- 1.9 to 0 - e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, etc D -&gt; 10 - conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis</li> </ul></li>	_	
Conduit EntriesGland M20; Material dependent on the approval: - For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic: Plastics M20x1.5 for cable ø5 to 10 mm (0.2 to 0.39 in) - For Dust-Ex, FM IS, CSA IS, CSA GP, Ex nA: Metal M20x1.5 for cable ø7 to 10 mm (0.28 to 0.39 in) 1) - For Ex d: No gland availableThread - ½" NPT - G ½" - M20 × 1.5Plug M12 / Plug 7/8" - Only available for Non-Ex, Ex ic, Ex iaAmbient TemperatureUnit: -40 °F and +176 °F (-40 °C and +80 °C) Display: -4 °F and +158 °F (-20 °C and +70 °C)Operating FrequencyApprox. 80 GHz, up to 8 devices can be installed in the same tankDielectric ConstantsA0 - 1.2 to 1.4 - Butane, liquid nitrogen, liquefied hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. devices, esters, aniline, alcohol, acetone, etc D -> 10 - conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis	Enclosure	<ul> <li>With closed housing tested according to: – IP68, NEMA6P (24 h at 1.83 m under water surface) – For plastic housing with transparent cover (display module): IP68 (24h at 1.00 m under water surface) – IP66, NEMA4X</li> <li>With open housing: IP20, NEMA1</li> <li>Display module: IP22, NEMA2</li> <li>Housing GT19: plastic</li> <li>Housing GT20: aluminium, seawater</li> </ul>
- For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic: Plastics M20x1.5 for cable \$\$ to 10 mm (0.2 to 0.39 in) - For Dust-Ex, FM IS, CSA IS, CSA GP, Ex nA: Metal M20x1.5 for cable \$\$ to 10 mm (0.28 to 0.39 in) 1) - For Ex d: No gland availableThread - ½" NPT - G ½" - M20 × 1.5Plug M12 / Plug 7/8" - Only available for Non-Ex, Ex ic, Ex iaAmbient TemperatureUnit: -40 °F and +176 °F (-40 °C and +80 °C) Display: -4 °F and +158 °F (-20 °C and +70 °C)Operating FrequencyApprox. 80 GHz, up to 8 devices can be installed in the same tankDielectric ConstantsA0 - 1.2 to 1.4 - Butane, liquid nitrogen, liquefied hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. benzene, oil, toluene, etc 	Antenna	IP 68 (NEMA 6P)
- Only available for Non-Ex, Ex ic, Ex ia         Ambient Temperature       Unit: -40 °F and +176 °F (-40 °C and +80 °C) Display: -4 °F and +158 °F (-20 °C and +70 °C)         Operating Frequency       Approx. 80 GHz, up to 8 devices can be installed in the same tank         Dielectric Constants       A0 - 1.2 to 1.4 - Butane, liquid nitrogen, liquefied hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. benzene, oil, toluene, etc C - 4 to 10 - e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, etc D -> 10 - conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis	Conduit Entries	<ul> <li>For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic: Plastics M20x1.5 for cable Ø5 to 10 mm (0.2 to 0.39 in)</li> <li>For Dust-Ex, FM IS, CSA IS, CSA GP, Ex nA: Metal M20x1.5 for cable Ø7 to 10 mm (0.28 to 0.39 in) 1)</li> <li>For Ex d: No gland available</li> <li>Thread</li> <li>½" NPT</li> <li>G ½"</li> <li>M20 × 1.5</li> </ul>
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Dielectric Constants       A0 - 1.2 to 1.4 - Butane, liquid nitrogen, liquefied hydrogen         A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas       B - 1.9 to 4 - non-conducting liquids, e.g. benzene, oil, toluene, etc         C - 4 to 10 - e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, etc       D -> 10 - conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis	Ambient Temperature	
hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas B - 1.9 to 4 - non-conducting liquids, e.g. benzene, oil, toluene, etc C - 4 to 10 - e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, etc D -> 10 - conducting liquids, e.g. aqueous solutions, dilute acids, and alkalis	Operating Frequency	
Hygienic Approvals CoC-ASME BPE	Dielectric Constants	hydrogen A - 1.4 to 1.9 - non-conducting liquids, e.g. liquefied gas
· /0·		C - 4 to 10 - e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, etc D - > 10 - conducting liquids, e.g. aqueous solutions,

**Note!** Please complete an Application Data Sheet for this equipment to facilitate proper selection of options for your unique application. Contact your Varec Sales Representative for more information.



# **Dimensions**

**Note!** Aluminum housing shown with example antenna (not all possible configurations shown).





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