

The all-new Raptor tank gauging system  
**Always ready for your next challenge**

**Raptor**  
OPEN SYSTEM



**ROSEMOUNT**  
Tank Gauging

  
**EMERSON**  
Process Management

A large, white, cylindrical industrial storage tank dominates the right side of the image. A spiral staircase with metal railings winds around the tank. Two workers, wearing red hard hats and safety harnesses, are on the stairs. One worker, in a pink shirt, is higher up and holding a clipboard. The other worker, in a blue shirt, is lower down. The background is a clear blue sky with a bright sun in the upper left corner. The overall scene is industrial and professional.

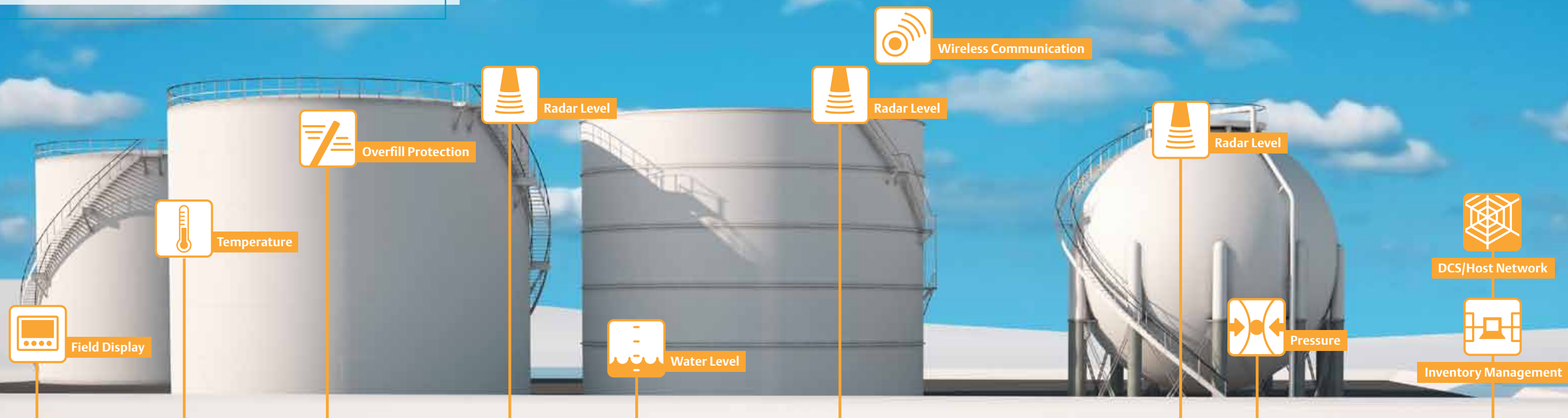
## A new time has come **Welcome to the Raptor age**

The all-new Raptor tank gauging system offers an open architecture and virtually unlimited possibilities. Total flexibility, unparalleled safety characteristics and outstanding cost efficiency in installation and system configuration are some of the benefits. Simply put, no matter what your next challenge is, Raptor will be ready. The cabling is simplified into a 2-wire bus and we offer a smart, self-organizing wireless network solution for demanding sites. Raptor components can

emulate and connect other vendors' equipment and can easily adapt to varying needs within the same installation. What is more, the open architecture promotes a future-proof system design that will help protect your investments. Add to that the supreme accuracy, reliability and world-wide technical support that come with Rosemount Tank Gauging standards. Are you ready to enter a new era in tank gauging?



## An open, scalable system for true tank intelligence



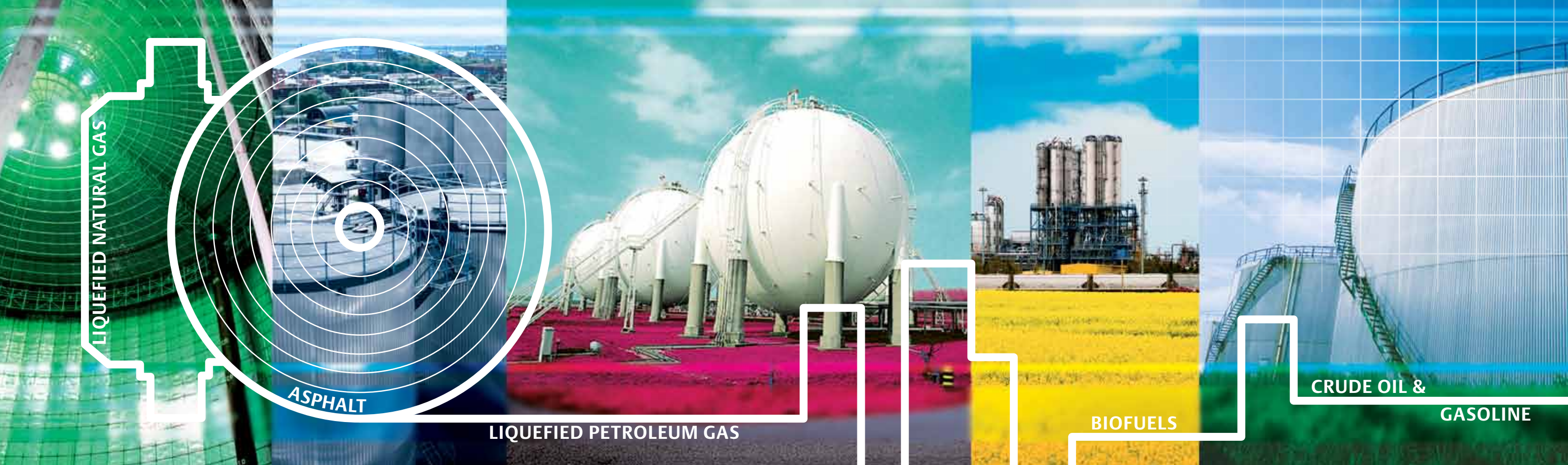
Expanding or refurbishing a tank farm for better and safer performance means that you have to connect new equipment to your existing installation. This is also the case when you replace outdated or damaged equipment or when you decide to add new functionality. These are only a few of the reasons why flexibility is a key factor in successful investments in tank gauging.

Raptor is a scalable open-architecture system. It features a complete line of new state-of-the-art Rosemount Tank Gauging components, including high-

precision radar gauges. As always, safety is a top priority and Raptor offers certified SIL 3 and 2-in-1 overfill protection.

Raptor uses a 2-wire high-speed FOUNDATION fieldbus based Tankbus which not only saves installation time and money but also opens up for the use of a wide range of standardized equipment. Add to that Emerson's Smart Wireless concept with self-organizing WirelessHART networks for keeping your measurements undisturbed.





## When every drop counts, you can count on radar technology

The benefits of Raptor's unique radar precision are obvious. Faster and more accurate inventory and custody transfer calculations. More reliable data for accounting and tax purposes. The economic implications of product transfer, inventory management and loss control are substantial, and by using precision equipment for tank management, you can strengthen both your plant's efficiency and its overall profitability.

### Radar gauging is not what it used to be

When we first introduced radar-based gauging for storage tanks it was seen as an exclusive high end product, as is often the case with new, ground-breaking technology. However, as production volumes increased and the general price decrease in electronics continued, radar gauges gradually became a less costly alternative. Today you may be surprised by the possibilities and the short pay-back time offered by non-contact radar gauging. So there might be good reasons to reconsider and find out what Raptor can do for you.

### Upgrade your system – no matter which one you have

One main benefit of the Raptor system's components is that they can be added to existing installations – even those from other vendors. Bit by bit, section by section, you can upgrade to Raptor performance. You will benefit from our vast experience in emulation and your migration will proceed seamlessly. Your first Raptor units will blend in with your existing control room infrastructure, and later when you upgrade to TankMaster, any remaining equipment from the other vendor will work just as before.

### For all bulk liquid applications

Virtually maintenance-free, without moving parts and with state-of-the-art accuracy. These are characteristics vital to efficient and profitable tank management. And, no matter what's in your tanks, there is a Raptor system that will add value to your operation. Refineries, storage and marketing terminals are obvious users, but the needs of the chemical industry, biofuel manufacturers, LNG plants, airports, power

plants and many others are equally important to us. Raptor components also easily adapt to any type of tank and come with a wide range of installation options. Furthermore, the size of your storage plant doesn't matter – there is an optimal Raptor configuration for every application.

### Choose the right accuracy

Even if accuracy is always important, the need varies. That's why the Raptor system includes radar gauges with  $\pm 0.5\text{mm}$  (0.02 in.) and  $\pm 3\text{mm}$  (0.12 in.) accuracy. Your choice of unit depends on your specific requirements. For high precision applications you can rest assured that Raptor performs even beyond the highest custody transfer standards – and you can combine all system components freely within the system.

But there is more to accuracy than just precise measurement of level. Multi-spot temperature, water level measurement and the calculation algorithms to determine the actual net volume of the liquid are just as important.

Add pressure measurement, and density and mass will be calculated on-line as well. And with the TankMaster tank management software you'll have both overview and details at your fingertips.



**Rosemount 2230**  
The 2230 Graphical Field Display presents tank data such as level, temperature, and pressure.

### RAPTOR - A NEW ERA IN TANK GAUGING

- A new level of system flexibility
- Future-proof open system architecture
- SIL 2 and SIL 3 certified safety
- Bus powered 2-wire Tankbus
- Emerson Smart Wireless capability
- Emulation of standard and proprietary protocols
- Enhanced non-contact radar measurement



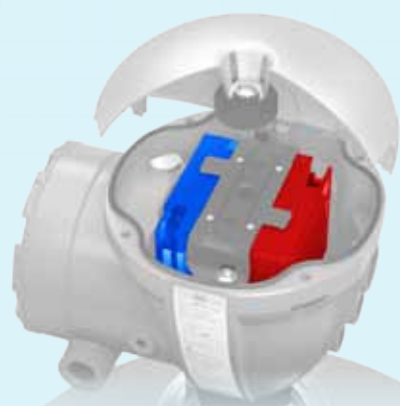


## Excellence in overfill prevention taking safety to a higher level

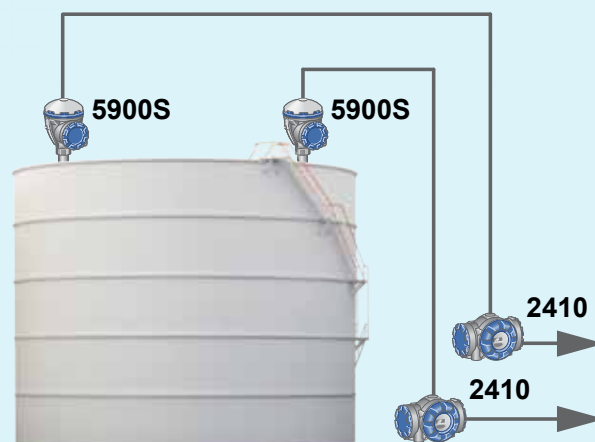
Being the inventor and market leader of radar tank gauging, we also possess unparalleled experience when it comes to safety and overfill prevention. Customers with a wide variety

of applications and more than 100,000 radar units delivered to date confirm that the way we integrate product features, quality, support and certification creates true safety bene-

### A RANGE OF REDUNDANCY FEATURES FOR FURTHER SAFETY ENHANCEMENT



The unique 2-in-1 feature has two independent radar units in one gauge, enabling SIL 3 certification for highest overfill prevention functionality.



Wherever required, Raptor can include dual redundancy features in field instruments or at the control room network level.

fits. Rosemount Tank Gauging products are already market-leading overfill protection devices, and now we are taking further steps in helping you to comply with existing and future legislation. The Rosemount 5900S radar gauge can be delivered as SIL 3 certified, a unique safety rating achieved by means of the 2-in-1 feature. The dual redundancy 2-in-1 gauge uses one tank opening only, which saves installation cost. Raptor precision and radar-grade reliability are also crucial in dry-run protection applications.

#### Radar never sleeps

The strength of radar measurement becomes very clear when it comes to overfill protection. Radar-based tank gauging can easily be configured to provide High (H) and/or High-High (HH) alarm signals. The function is checked continuously during operation. This gives far more efficient proof testing compared to conventional solutions with High-High level alarm switches. With such passive functions you only know for sure that they work at the instant you run a test. Should an incident occur between tests you can only hope that everything still operates as it should.

#### Reliability is the foundation for safety

A Raptor radar gauge is reliable, accurate and in continuous operation, which means increased time margins before a critical situation occurs. The update of measured data is fast, level as well as temperature and pressure can be taken into account by the system in order to generate early warnings. And with a high reliability system you will be able to utilize your tank capacity better without increasing the risk of overfill.

#### Installation advantages

With the Raptor system you also benefit from the two-wire bus from the safety viewpoint. An intrinsically safe two-wire Tankbus means not only reduced cabling but also a reduced number of high-voltage points on the tank.

CERTIFIED

SAFETY







## The simplicity of the two-wire bus – or why not wireless?

With the Raptor system, installation and maintenance become an easier task. Compared to today's cabling, Raptor's two-wire bus offers true simplicity. The number of wires drops radically. Since there is no need for cable conduits on the tank, the cost of additional material is also substantially lower. The installation process requires fewer resources and is completed in a fraction of the time traditionally needed. The fact that the bus is intrinsically safe and powered simplifies both planning and the execution of installation work. The reduced need for separate power cables means fewer junction boxes and less cabling. This saves maintenance time and money.

### Easy configuration does it!

After installation the gauging system has to be configured. This is done easily and conveniently by using the TankMaster PC software. As an alternative the 475 Field Communicator can be connected directly to the IS Tankbus units for configuration in the field.

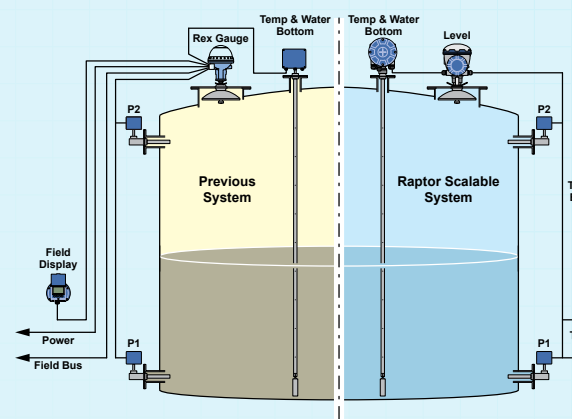
### The wonder of wireless

In most cases, the Raptor system uses the existing field cabling. However, sometimes this is not possible and even a two-wire installation becomes complicated. For instance if it is necessary to cross a road or to connect units located where distance or ground conditions make cabling expensive.

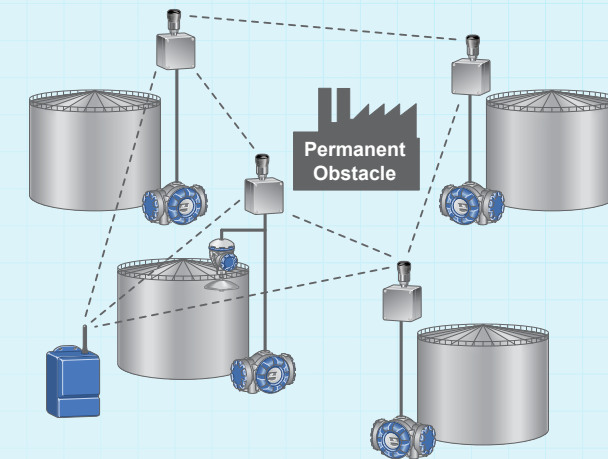
Raptor supports Emerson's Smart Wireless concept based on WirelessHART, which brings with it unique advantages. The wireless network is self-organizing and the system software automatically optimizes connectivity in order to maximize data transfer reliability. Furthermore, each wireless unit acts as a network connector – or repeater – and this dramatically increases the system's performance. There

is no need for a direct line of sight between an instrument and the communication gateway. Any unit within range will relay the signal, so there is no single point of failure. Consequently system performance is maintained in the event of unexpected obstructions of radio transmission.

## SAVE INSTALLATION COST



The Raptor two-wire Tankbus requires less cabling.



When using Emerson Smart Wireless the system can be installed without any long distance field cabling.





# Stay on top On-site or on the web

## System architecture for real-world plants

Raptor field architecture is designed for maximum flexibility and lowest installation cost. The FOUNDATION fieldbus based Tankbus links all tank instrumentation communication to our proven TRL2 fieldbus via the 2410 Tank Hub. The TRL2 fieldbus communicates over long distances to the control room. In this way you benefit from the best of two worlds:

- High-speed open architecture FOUNDATION fieldbus communication on the tank, making available a wide range of current and future tank gauging equipment.

- Robust long-distance communication using the TRL2 fieldbus designed for use on tank storage plants with existing field cabling.

As an alternative, it is possible to implement native FF communication all the way to the control room area.

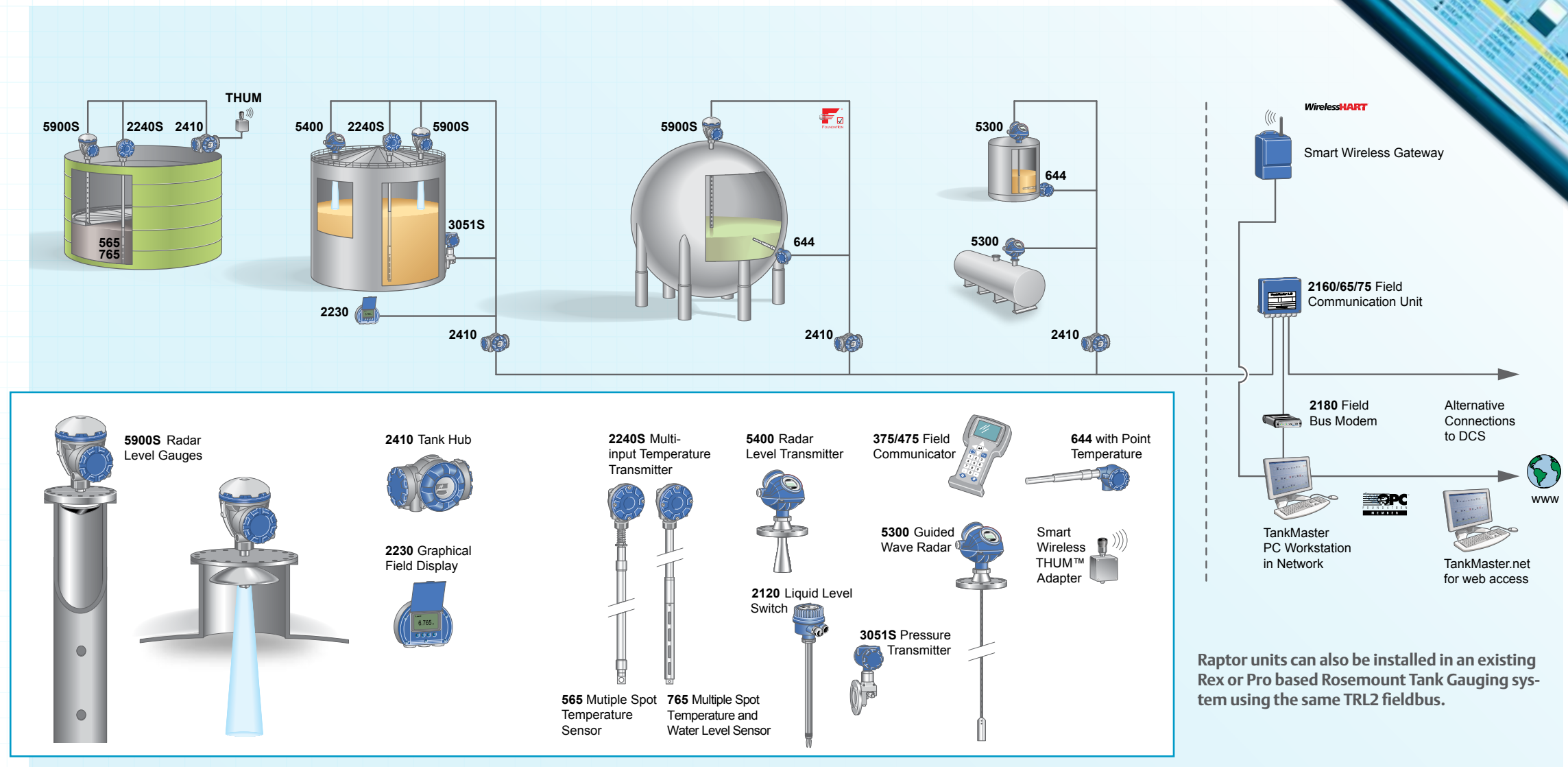
Raptor radar tank gauging constitutes the state-of-the-art technology for virtually all storage tank applications. And to fully take advantage of the precision and reliability of the incoming data, Raptor includes the powerful and very user-friendly TankMaster software package.

## Accurate and versatile

TankMaster provides complete tank inventory management. It includes functions for custody transfer and inventory control, as well as set-up, configuration and service. All calculations are based on current API and ISO standards.

Raptor with the TankMaster software both provide an overview and focus on detail: Total Observed Volume, Gross Observed Volume, Gross Standard Volume and Net Standard Volume. By adding pressure transmitters you can also keep track of hydrostatic and vapor pressure, density and mass.

TankMaster presents all these parameters on-line, and with TankMaster.net you can offer remote access via the web interface – to others in your own organization or to clients and partners.



## Compatibility and simplicity

TankMaster follows the OPC standard for easy device mapping and communication with Microsoft® programs and other OPC compatible systems. SCADA/DCS communication to all major vendors takes place via MODBUS or OPC.

The reporting facilities are extensive and include customized reports, batch reports, reports via e-mail, audit logs for specific events and historical data sampling. In addition, alarms are not only displayed on screen, they can

also be sent via e-mail or to mobile phones.

Configuration and installation are done via a set-up wizard. TankMaster is also available in other languages than English.

# Expansion or migration?

## Emulation gives you freedom of choice

Raptor is designed throughout to be the best-performing tank gauging system ever built. But we are aware of the facts of real life. There are numerous tank farms where gauging based on older technology has been installed fairly recently, with budget and resource restrictions making it unrealistic to replace an entire installation in one single project.

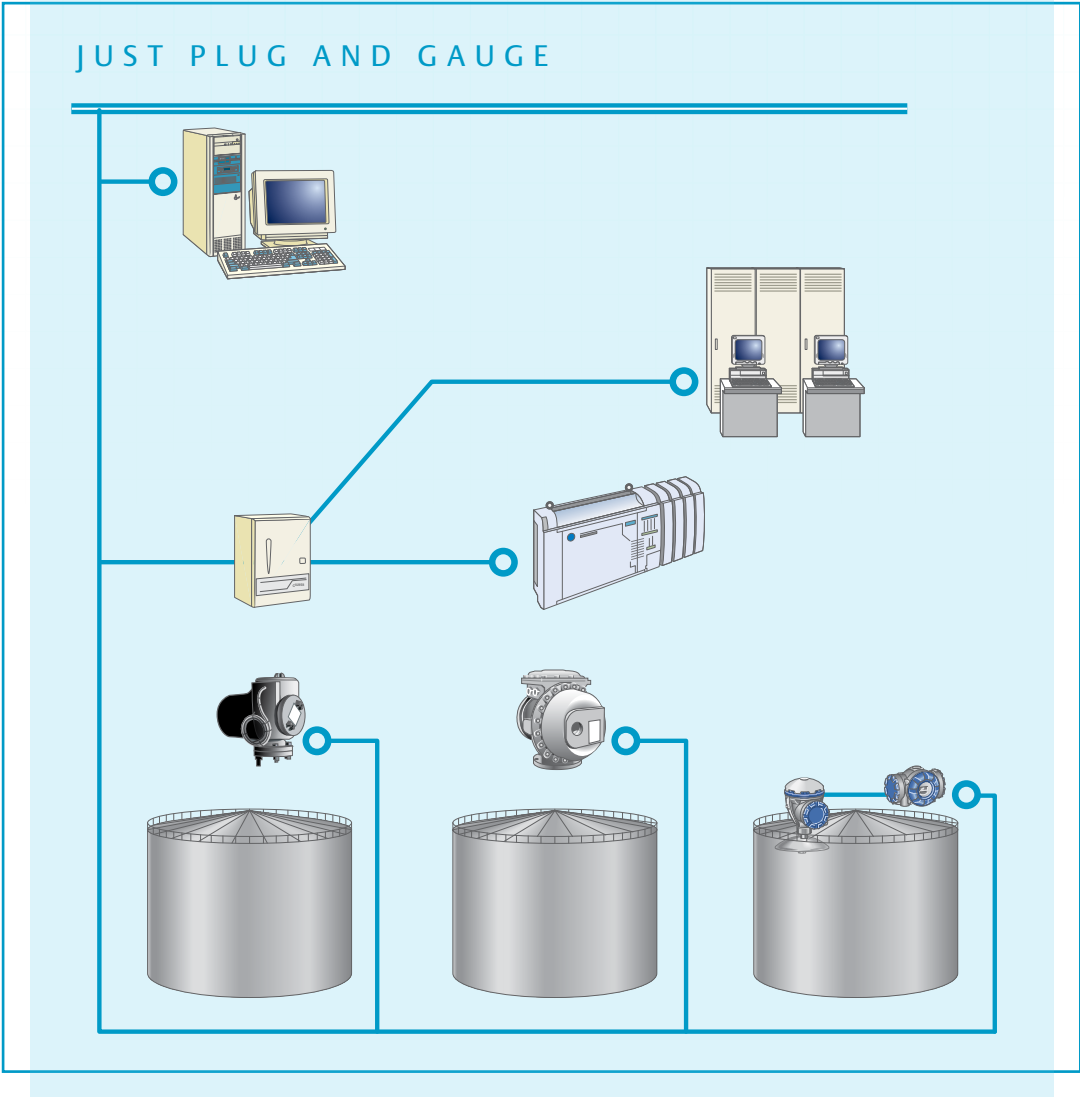
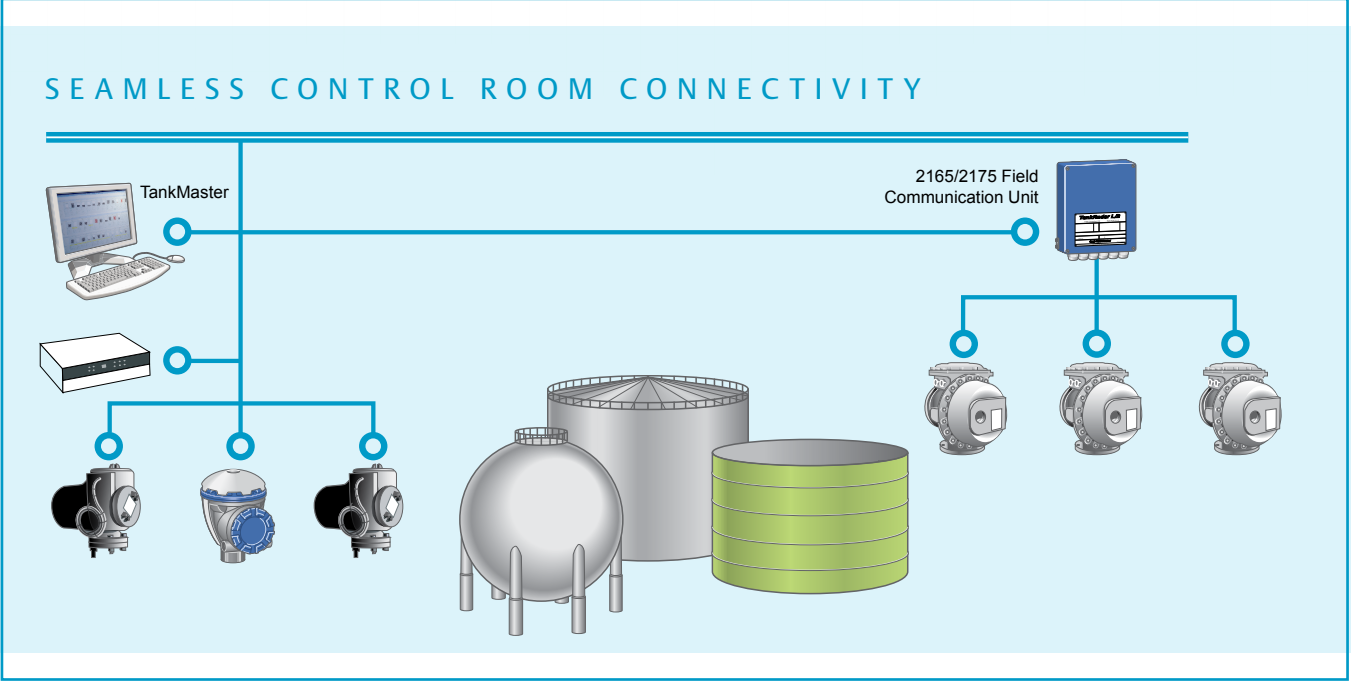
### Stuck with outdated technology?

A common misunderstanding is that upgrading to modern radar tank gauging is impossible if you've already installed a system from another vendor. This is not the case. Raptor is designed to co-exist with many other types of tank gauging equipment. Through emulation, Raptor units can be added to an existing system using the previous vendor's fieldbus

communication. There is no need for rewiring or trenching. This means that you can upgrade to Raptor bit by bit and you're not stuck with your present supplier.

Emulation is also applicable to the control room. Somewhere during the migration process it will be necessary to replace the tank management software and control room equipment. Your existing software can be changed to Rosemount TankMaster, enabling seamless connectivity and trouble-free communication with existing devices. Lean and clean.

By careful planning, an existing installation can be modernized step by step. Cutting expenses related to spare parts and maintenance is one benefit, the increase in precision and efficiency is another.



**Rosemount 2410**  
The 2410 Tank Hub powers the measuring devices on the tank. It also sends measured data to the control room via a Field Communication Unit.



# The precision instruments of tank gauging



5900S WITH LPG/  
LNG ANTENNA

- Pressurized or cryogenic liquefied gas
- Strong echo even under surface boiling conditions
- Vapor pressure sensor for top-class measurement



5900S WITH HORN ANTENNA

- Fixed roof tanks without still-pipe
- 200 mm (8-in.) or larger nozzles
- Oil products and chemicals except for asphalt



5900S WITH PARABOLIC ANTENNA

- General use in tanks without still-pipe
- Demanding environments such as sticky liquids
- Installation close to tank wall possible



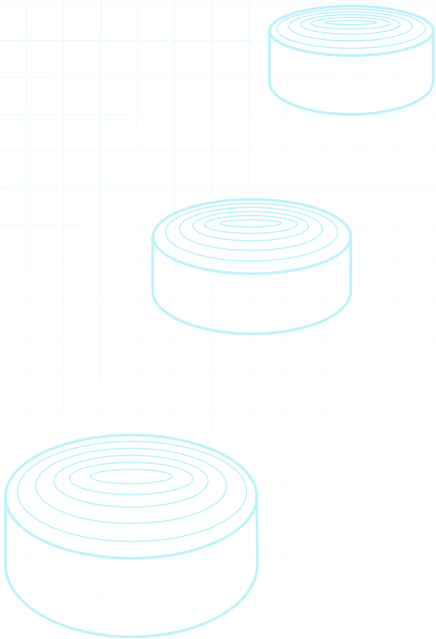
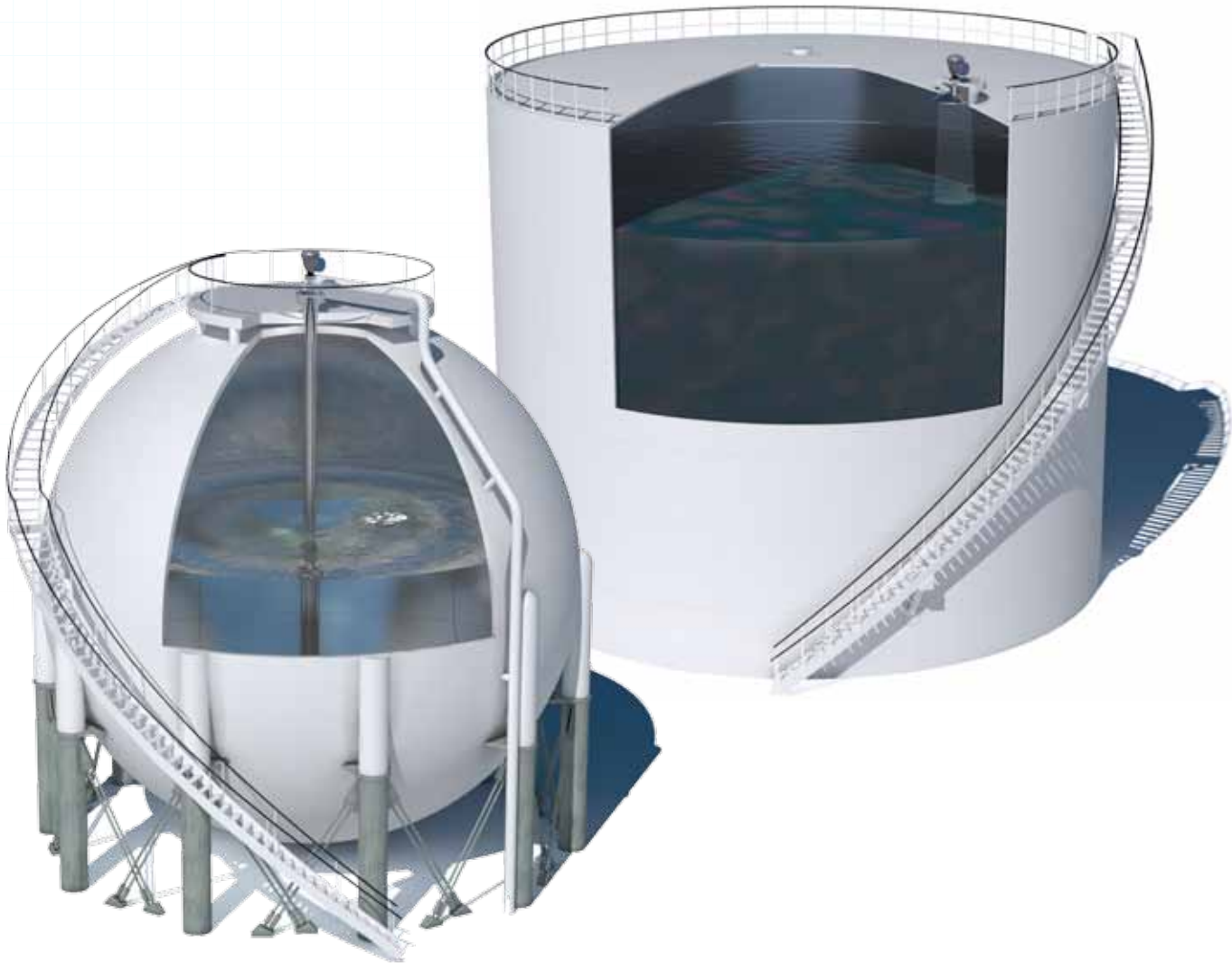
5900S WITH STILL-PIPE  
ARRAY ANTENNA

- New or existing still-pipes
- Crude oil tanks with floating roofs
- Gasoline tanks

The strength of Rosemount Raptor is the fact that it is a scalable open system – developed by the market leader and the inventor of radar tank gauging. However, the strength of a chain depends on every single link. Each Raptor installation is built from a range of first-class components, and it all starts with the radar units. The precision, quality and proven

reliability of our radar units constitute the base for years and years of accurate and trouble-free operation.

The radar gauges feed the system with the most critical input data, and it is here the standard is set. Our 10 GHz FMCW-radar technology ensures reference instrument accuracy of 0.5 mm (0.02 in.) which not only meets but exceeds the API and OIML custody transfer requirements. As a tank farm operator you benefit from this through more accurate billing and better tank utilization.



# The Raptor line-up

Raptor's true scalability means that the system can be configured to provide the optimum solution for every bulk liquid storage tank. Functionality spans from radar level measurement only, to a complete custody transfer approved measuring and overfill prevention system with level gauging, precise multiple spot temperature and pressure measurement, plus full inventory management software with net volume, mass

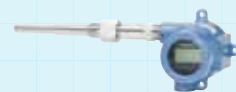
and density calculations.

For level measurement we recommend the ultra high precision 5900S series described on the previous pages. However, as an alternative the 5300 and 5400 series provide cost efficient gauging where medium accuracy is required. All components at the tank are bus powered using 2-wire cabling for lowest installation cost.



## 2240S Temperature Transmitter with Multiple Spot Temperature and optional Water Level Sensor

The ultra-stable Rosemount 2240S Multi-input Temperature Transmitter is used to connect a sensor with up to 16 RTD temperature elements providing highly precise average temperature and temperature profiling. A capacitance based level probe can be integrated in the sensor to measure water bottom level.



## 644 Transmitter with Single Point Temperature Sensor

Rosemount 644 is used with a single point temperature sensor where no average temperature measurement is required.



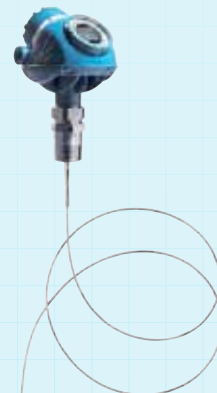
## 3051S Pressure Transmitter

One or more high precision pressure transmitters can be used on each tank to provide vapor and liquid pressure measurement for on-line-density and hybrid calculations.



## 5400 Series Radar Level Transmitter

The Rosemount 5400 is a reliable radar level transmitter, to be used in medium-accuracy applications. It is unaffected by most liquid properties such as density etc. It is TÜV approved for overfill protection.



## 5300 Series Radar Level Transmitter

The Rosemount 5300 series is a premium guided wave radar for level measurement to be used in medium-accuracy applications. It has a complete range of probe styles. The 5300 is TÜV approved and suitable for use in SIL 2 overfill prevention applications.



## 2230 Graphical Field Display

The backlit Rosemount 2230 Graphical Field Display presents inventory tank data such as level, temperature and pressure. It is mounted on the tank top or on ground level.



## 2410 Tank Hub

The Rosemount 2410 Tank Hub communicates with, and powers the field devices on the FISCO compliant intrinsically safe Tankbus. It also sends measured data on the fieldbus to the control room via a Field Communication Unit. The 2410 hub has an optional integrated display.

It is available in two versions, one for single and one for multiple tanks.



## Smart Wireless THUM™ Adapter

The Smart Wireless THUM™ Adapter provides the wireless output from the Tank Hub to the Smart Wireless Gateway. A THUM™ adapter is connected to a Tank Hub and is normally positioned at the tank roof for communication with other wireless nodes.



## Smart Wireless Gateway

The Smart Wireless Gateway is the WirelessHART™ network manager that collects data from the devices in the Smart Wireless tank gauging network.



## 475 Field Communicator

The intrinsically safe graphical 475 Field Communicator is a hand held device that provides an optional common communication link to all Raptor field units for field configuration and service.



## 2160/65/75 Field Communication Unit

The Rosemount 2160, 2165 and 2175 Field Communication Unit polls data from all 2410 hubs and, upon request, sends tank data to the host computer in the control room.

The Field Communication Unit communicates with all common host/DCS systems and also other vendor's gauges and control room equipment.

Two units can be connected in parallel with one unit working as backup for the other.



## 2180 Field Bus Modem

Rosemount 2180 Field Bus Modem is used for connecting a PC with the TankMaster inventory software to the fieldbus and the Field Communication Unit.

This modem is normally included when more than one Field Communication Unit is installed and when they are mounted far apart from the TankMaster PC.



## TankMaster

The TankMaster software includes a powerful inventory management module giving the operator complete overview of the tank plant with graphics, reports and alarms. Net volume calculations according to API and ISO provide all data to keep track of the large economic value represented by the bulk liquids.

A number of TankMaster PCs can be connected in a network to distribute tank data within the plant, via a LAN and globally on the Internet.

The TankMaster software is also the primary system configuration tool.



For additional information please contact:

**Radar Tank Gauging Ltd**

7 Weller Drive  
Finchampstead  
Wokingham  
RG40 4QZ, United Kingdom

Tel: +44 (0)118 973 6670  
Email: [info@radartg.com](mailto:info@radartg.com)  
Web: [www.radartg.com](http://www.radartg.com)



**ROSEMOUNT®**  
Tank Gauging

  
**EMERSON™**  
Process Management