Rosemount™ TankMaster™
Inventory Management Software
for tank gauging systems

Higher tank farm efficiency by precise tank content monitoring

- Get automatic inventory calculations with API standard net volumes
- Achieve network interoperability with host systems and other vendors’ devices
- Detect abnormal roof conditions with proactive monitoring of floating roofs
- Improve safety with easy-to-use alarm management and remote proof tests
Gain control over your inventory data

TankMaster is a powerful, easy-to-use Windows™-based inventory management software package. It provides operator overview, inventory and custody transfer functions, configuration and service for Rosemount Tank Gauging systems.

This software collects all tank gauging data such as level, temperature, water interface, and pressure from devices in the Rosemount tank gauging system. It automatically calculates volume and mass for inventory and custody transfer tanks. The operator will be able to respond faster to changing tank farm conditions. This will maximize the plant effectiveness, increase productivity, and reduce costs.

Inventory and custody transfer functions

- Real-time tank gauging data such as level, temperature, water interface level, and pressure
- Online gross and net volume inventory calculations based on API and ISO standards
- Hybrid tank gauging with pressure inputs giving data for density and mass calculation
- Batch handling makes it possible to control and follow transferred volumes from the control room

Improve operator overview

The “tank farm explorer” makes it easy to navigate in TankMaster. TankMaster provides several efficient features:

- Customized views with graphic plant layouts
- Advanced group configuration in geographical or product groups etc.
- A user manager with different access levels for personnel
- A setup wizard for guided configuration of all devices in a Rosemount tank gauging system

Constant 24/7 floating roof monitoring

TankMaster provides real-time verification that the floating roof is operating as normal. When including floating roof functionality and devices, TankMaster monitors for deviations such as roof tilt and drain sump clogging.

Automatic monitoring provides the ability to take preventive measures before a critical incident. A warning given before you have liquid on top of the roof allows for less manual inspection work on the tank roof.

Contents

Ordering information .................................. 4
Specifications ............................................. 6
Make essential tank gauging data available

By sharing data with users on all levels of the enterprise through modern network connectivity, operators and plant management are better equipped to make timely decisions.

TankMaster comes in two versions:

- **TankMaster WinOpi** is a complete custody transfer and inventory software package. All calculations are based on current API and ISO standards.
- **TankMaster WinView** is a software package with basic inventory capabilities. It is a cost-efficient alternative for operational control at smaller tank terminals, marketing terminals, biofuels, chemical plants, etc.

**Full network capabilities**

- It is possible to build a network of several server and client PCs with TankMaster software.
- The networking function makes it possible to work with TankMaster from any PC in the network.
- The operator can configure tanks, handle tank gauging and inventory data, and accept alarms.

TankMaster distributes essential inventory tank gauging data.
# Ordering information

## Rosemount TankMaster Inventory Management

![Rosemount TankMaster Inventories](image)

**Additional information**

Specifications: [page 6](#)

## Table 1. Rosemount TankMaster Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Product description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM</td>
<td>Rosemount TankMaster Inventory Management</td>
</tr>
</tbody>
</table>

### License

<table>
<thead>
<tr>
<th>Model</th>
<th>Product description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM</td>
<td>TankMaster Demo (no dongle included)</td>
</tr>
<tr>
<td>05(2)</td>
<td>TankMaster WinOpi, with TankServer for up to 5 tanks, including WinSetup</td>
</tr>
<tr>
<td>20(2)</td>
<td>TankMaster WinOpi, with TankServer for up to 20 tanks, including WinSetup</td>
</tr>
<tr>
<td>50(2)</td>
<td>TankMaster WinOpi, with TankServer for up to 50 tanks, including WinSetup</td>
</tr>
<tr>
<td>MX(2)</td>
<td>TankMaster WinOpi Max (unlimited number of tanks(3)), including WinSetup</td>
</tr>
<tr>
<td>V2(4)</td>
<td>TankMaster WinView, with TankServer for up to 20 tanks, including WinSetup</td>
</tr>
<tr>
<td>V5(4)</td>
<td>TankMaster WinView, with TankServer for up to 50 tanks, including WinSetup</td>
</tr>
<tr>
<td>WS(5)</td>
<td>TankMaster WinSetup</td>
</tr>
</tbody>
</table>

### Host communication

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>C(6)</td>
<td>TankMaster communication module</td>
</tr>
<tr>
<td>S(6)(7)</td>
<td>TankMaster communication module with office link</td>
</tr>
</tbody>
</table>

### Network clients

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>1(8)</td>
<td>One TankMaster client can connect and read data</td>
</tr>
<tr>
<td>2(8)</td>
<td>Two TankMaster clients can connect and read data</td>
</tr>
<tr>
<td>3(8)</td>
<td>Three TankMaster clients can connect and read data</td>
</tr>
<tr>
<td>4(8)</td>
<td>Four TankMaster clients can connect and read data</td>
</tr>
<tr>
<td>5(8)</td>
<td>Five TankMaster clients can connect and read data</td>
</tr>
<tr>
<td>6(8)</td>
<td>Six TankMaster clients can connect and read data</td>
</tr>
<tr>
<td>7(8)</td>
<td>Seven TankMaster clients can connect and read data</td>
</tr>
<tr>
<td>X(8)(9)</td>
<td>Specify number of clients</td>
</tr>
</tbody>
</table>
# Table 1. Rosemount TankMaster Ordering Information

<table>
<thead>
<tr>
<th>Custody transfer</th>
<th>0</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(^{(10)})</td>
<td></td>
<td>TankMaster custody transfer functions</td>
</tr>
<tr>
<td>P(^{(11)})</td>
<td></td>
<td>TankMaster custody transfer functions PTB Eich</td>
</tr>
</tbody>
</table>

## Batch handling

<table>
<thead>
<tr>
<th>0</th>
<th>Default batch functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B(^{(12)})</td>
<td>Extended batch functions</td>
</tr>
</tbody>
</table>

## HTG

<table>
<thead>
<tr>
<th>0</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>TankMaster hydrostatic tank gauging functions and calculations</td>
</tr>
</tbody>
</table>

## Customization

<table>
<thead>
<tr>
<th>0</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Customized views</td>
</tr>
</tbody>
</table>

## Redundancy

<table>
<thead>
<tr>
<th>00</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT(^{(13)})</td>
<td>TankMaster redundancy</td>
</tr>
</tbody>
</table>

## Options (include with selected model number)

### Floating roof monitoring

| TF | Floating roof monitoring |

### Typical model number: TM 20 S N C C P C RT TF

1. Note that each Rosemount 5900S Radar Level Gauge with 2-in-1 functionality corresponds to two tanks.
2. Configuration, view, and alarm handling. Volume calculations according to API. Includes WinSetup.
3. Maximum 150 tanks per TankMaster server.
4. Configuration, view, alarm handling, and limited inventory calculations. Includes WinSetup. Requires option code “0” or “00” for Network clients, Custody transfer, Batch handling, HTG, Customization, and Redundancy. Not available with Floating roof monitoring option code TF.
5. Configuration and installation of devices and tanks. WinSetup only.
6. For connection between TankMaster and SCADA / DCS/PLC via Modbus (RS232) and/or OPC DA. Requires WinOpi or WinView.
7. For connection between TankMaster and Microsoft®Office via OPC server. Includes OPC Office Client / Site Server License.
8. Number of other TankMaster PCs that can connect and read data simultaneous. This other TankMaster PC can be a TankMaster client or another TankMaster server.
9. Maximum 10 concurrent TankMaster clients.
10. Custody transfer windows. Includes hardware key, custody transfer seal and metrological seal for custody transfer approvals.
11. Custody transfer windows. Includes hardware key, PTB sticker, custody transfer seal and metrological seal for custody transfer approvals.
12. Stores closed batches up to 365 days, re-calculation of delivery ticket, Microsoft Access database files and “Tank Transfer Calculator”.
13. Requires two identical dongles (can be ordered separately), meaning duplicate redundancy licenses as well as other options (one per dongle).
Specifications

Functional specifications

For information on what features are included in which TankMaster version, see “TankMaster versions” on page 13.

User-friendly navigation

The “tank farm explorer” makes it easy to navigate in TankMaster. It is possible to expand and minimize fields. The operator gets direct group and tank access by double-clicking the specific group or tank icon.

Customized views

There are a number of options for customized views; it is possible to either modify the existing window, or build completely new ones to show only the currently most interesting tank parameters. For example:

- A photo of the plant gives a realistic view and by clicking a specific tank, the corresponding tank data will be presented
- A window showing only the currently most interesting tank parameters

Interactive configuration and installation

A step-by-step wizard provides guided configuration and installation of all devices in a Rosemount tank gauging system.

Translation

TankMaster can be translated to any language. Users can change text in the dialogs and menus and verify translated text on site.

Tank gauging data

TankMaster collects real-time tank gauging data such as level, temperature, water interface level, and pressure.

Hybrid tank gauging

With a high accuracy hybrid tank gauging system, the need for manual density sampling is eliminated. With tank gauging data such as level, pressure, and temperature, the operator gets automatic density measurements and mass calculations from the TankMaster system.

LPG/LNG

For tanks containing liquid gas, a number of parameters are relevant. The mass of gas in the Available Room is calculated and the corresponding liquid equivalent volume is presented as Liq Equ in the Tank Inventory window.

The Molecular Mass and the Vapour-Liquid_Volume Ratios are entered into the TankMaster product table.

Density measurement with pressure transmitters

By complementing the level measurement with temperature and pressure measurement, the density of the product in the tank can be continuously calculated.

One or more pressure transmitters with different scalings can be used on the same tank to measure liquid and vapor pressure.

The accuracy of the density calculation largely depends on the accuracy of the pressure transmitter.

Data is calculated according to updated API and ISO standards. Temperature calculations include API algorithms to handle elements close to the bottom. The level value is software corrected for changes in tank reference height.

Data is presented using units from a wide selection; both metric and USA/UK units are supported. Secondary units are available.

TankMaster features very high accuracy net volume calculations (up to 5000 strapping points). Normally less than 100 points per tank are necessary for one-liter accuracy. Quadratic interpolation for spheres and horizontal cylinders is used, which increases volume accuracy and reduces number of strapping points required.

Inventory calculations

Real time inventory calculations include:

- Gross and net volumes as well as mass calculations, according to current API tables (6, 54, 24, A-D), ISO, and other major standards
- Tank capacity tables (5000 strapping points) for cylindrical and spherical tanks are supported
- Liquid and mass calculations of vapor in LPG according to ISO 4267
- Net Standard volume calculated at a user specified reference temperature
- Measured and calculated values displayed in secondary units; for example, the results can be shown in both bbl and °F, and m³ and °C at the same time
TankMaster calculations

The inventory calculations are normally based on volumes. The main calculation is to find a volume correction factor (VCF). The VCF is then used to calculate volume based on a reference temperature.

Inventory parameters are calculated based on input data available for the current tank. Figure 1 shows an example of how the measured product level is converted to a standardized volume.

Figure 1. Inventory Calculations

The inventory calculation is divided into four parts:

1. Calculation of observed volumes
2. Calculation of observed density
3. Calculation of reference density and Volume Correction Factor according to the selected volume correction table
4. Net volumes using the VCF

Total Observed Volume (TOV) is calculated from strapping tables. It is the total volume at the observed temperature of the product.

Gross Observed Volume (GOV) is obtained by subtracting the Free Water Volume (FWV) from the TOV. The FWV is calculated from the Free Water Level entered by the operator or measured automatically by using a water level sensor, such as Rosemount 765.

Gross Standard Volume (GSV) is the GOV corrected to the reference temperature 15 °C (60 °F). The correction is made using the Volume Correction Factor according to API Standard 2540.

Net Standard Volume (NSV) is calculated as the Gross Standard Volume minus the dissolved sediment and water. For liquid gas tanks, the liquid equivalent volume of the gas above the product surface is added. The WinOpi also includes a Leak Alarm based on changes of the NSV.

If a pressure transducer is installed in the tank and properly connected and configured, the density of the product can be calculated. This value is presented as the Observed Density.

The Reference Density is the density of the product at the standard reference temperature 15 °C (60 °F). It can either be manually entered, or automatically calculated from the Average Temperature and the Observed Density if it is available. The Reference Density is calculated using a VCF according to API Tables 5A, 5B, 53A, or 53B. The Observed Density can also be calculated based on the manually entered Reference Density.

Weight calculations are performed using the calculated volumes and either the manually entered density or the observed density. The Weight In Air (WIA) is calculated as the Net Standard Volume multiplied by the Weight Conversion Factor.
Figure 2. Tank Parameters and Physical Quantities

The figure illustrates the relationship between tank parameters and physical quantities. The main parameters are shown in the left-hand part, and the input parameters are shown in the right-hand part of the flow chart.

**TOV** Total Observed Volume  
**GOV** Gross Observed Volume  
**GSV** Gross Standard Volume  
**NSV** Net Standard Volume  
**WIA / WIV** Weight In Air / Weight In Vacuum  
**TCT** Tank Capacity Table  
**FWL / FWV** Free Water Level / Free Water Volume

**Technical Parameters**
- **CTSh**: Correction for Tank Shell temperature
- **TEC**: Tank shell Expansion Coefficient
- **FRA**: Floating Roof Adjustment
- **VCF**: Volume Correction Factor
- **S+W**: Sediment and Water
- **AVRM**: Available Room
- **VLVR**: Vapor Liquid Volume Ratio

**Physical Quantities**
- **Air Density**
- **Vapor Density**
- **Press Vapor**
- **Press Liq**
- **Press Sensor Levels**
- **Min Level**
- **Level**
- **Local Grav**
- **Obs Dens**
- **Avg Temp**
- **Ref Temp**
- **CTSh**
- **RT54 tables**
- **LPG / LNG tanks only**

---

TOV  Total Observed Volume  
GOV  Gross Observed Volume  
GSV  Gross Standard Volume  
NSV  Net Standard Volume  
WIA / WIV  Weight In Air / Weight In Vacuum  
TCT  Tank Capacity Table  
FWL / FWV  Free Water Level / Free Water Volume
Batch reports

The batch report provides transfer supervision, when making internal and external transfers in inventory and custody transfer tanks.

For example, when a ship calls at a plant, a batch report can be started, which presents information about when the transfer was started, elapsed time, remaining time, and estimated stop. An alarm is activated five minutes before, as well as after the transfer is ready. When the transfer is ready, the batch report can be printed for record keeping.

Automatic reports

Standard reports are automatically generated via PDF, text file, printer, or e-mail. The reports are arranged by tanks or groups. The time interval, report layout, and which parameters to include can be specified by the operator. All activities have a time stamp for reliable follow up.


The Log Report shows:
- Product
- Level
- Average temperature
- Net Standard Volume (NSV)
- Density
- Level status

<table>
<thead>
<tr>
<th>Tank</th>
<th>Product</th>
<th>Level</th>
<th>Avg Temp</th>
<th>NSV</th>
<th>Net Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Crude-Oil</td>
<td>10.00 ft</td>
<td>60.0°F</td>
<td>4060.3 ft³</td>
<td>1000.0 lb/ft³</td>
</tr>
<tr>
<td>T2</td>
<td>Par-Oil</td>
<td>12.50 ft</td>
<td>60.0°F</td>
<td>4500.0 ft³</td>
<td>1000.0 lb/ft³</td>
</tr>
</tbody>
</table>

The Mass Balance Report shows:
- Product
- Level
- Average temperature
- Total Observed Volume (TOV)
- Net Standard Volume (NSV)
- Weight In Air (WIA)
- Density
- Level status
- Difference in Net Standard Volume since last report

<table>
<thead>
<tr>
<th>Tank</th>
<th>Product</th>
<th>Level</th>
<th>Avg Temp</th>
<th>TOV</th>
<th>NSV</th>
<th>WIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Crude-Oil</td>
<td>10.00 ft</td>
<td>60.0°F</td>
<td>4060.3 ft³</td>
<td>4060.3 ft³</td>
<td>8000.0 lb</td>
</tr>
<tr>
<td>T2</td>
<td>Par-Oil</td>
<td>12.50 ft</td>
<td>60.0°F</td>
<td>4500.0 ft³</td>
<td>4500.0 ft³</td>
<td>8000.0 lb</td>
</tr>
</tbody>
</table>

Alarm handling

TankMaster features alarm summary, alarm log, and alarm event log for safe and reliable alarm handling.

When an alarm occurs, a bell rings and the alarm icon starts to blink. The operator can set different sounds for each alarm type. Alarms can also be sent via e-mail, or to mobile phones via an SMS Gateway. Alarms are customized at any station in the network and a client signature is saved at every acknowledgment. It is possible to view all alarms in the system or divide the alarms per group or per tank.

The operator can set alarm levels as well as hysteresis and delay times for level, average temperature, vapor temperature, analog input signals, flow rate, flow direction, and others.

Historical data sampling

The operator can collect historical data for reliable follow up. The generated reports are saved to file. A graph presents the historical trends.
Network capabilities

A network of several server and client PCs can be built. Access TankMaster from any PC in the network.

The networking functions enables working with TankMaster from any PC in the network. Updated real-time data are available on all TankMaster client PCs. The operator can install tanks, handle tank gauging and inventory data, and accept alarms on any PC.

Authority for alarm handling can be distributed in the network. If there are many control rooms, the operator can decide who will be responsible for which tanks in the tank farm, providing high security.

Figure 3. Access TankMaster from Any PC in the Network

Security

User manager

Several protection levels are implemented to avoid unauthorized changes. These protection levels are categorized as User Access Levels and User Sub Access Levels.

The User Access Levels are:

- Administrator
- Supervisor
- Operator
- View only

Each User Access Level has five User Sub Access Levels. This gives a total of 20 unique access levels.

The users can log on and off without restarting the program. In the alarm log it is possible to track who acknowledged a certain alarm. When the shift is over, the operator logs out and the new operator takes over and logs in.

In order to change tank and device configuration, to install new tanks and devices, to calibrate a transmitter, to change holding register values, etc., the user has to be logged on to TankMaster. To perform any such action, the user has to be logged on at the required access level for that action. Different access levels can be set for each window.

Backup

The backup function can be used to save configuration data for devices and tanks, as well as workspace settings.

This function preserves all settings in a format that facilitates a full system restore. Using the backup functionality, the following data can be stored:

- Tank and device configurations
- Any previously created Historical Data
- Workspace configuration such as tank groups, colors, network settings, etc.
Supported devices

The WinSetup program supports installation and configuration of the following devices:

**Tank Gauging key devices**

- Rosemount 5900S Radar Level Gauge
- Rosemount 5900C Radar Level Gauge
- Rosemount 5300 Level Transmitter, 5400 Level Transmitters
- Rosemount 2460 System Hub, Rosemount 2410 Tank Hub
- Rosemount 2240S Temperature Transmitter
- Rosemount 2230 Graphical Field Display

**Wireless devices**

- Emerson Wireless 775 THUM™ Adapter
- Rosemount 3308 Wireless Level Transmitter
- Emerson 1410 Wireless Gateway
- Emerson 1420 Wireless Gateway
- Generic Wireless devices

**Devices from other Vendors**

- Enraf® CIU, Enraf servo, L&J servo, Varec® servo, Whessoe servo, E+H MDPII, L&J MCG3221, Tokyo Keiso servo, Sakura servo, E+H NRF590/Varec 4590

**Generic drivers**

- Generic ModbusMaster, Generic OPC Server Device

**Tank Gauging legacy devices**

- Rosemount TankRadar Pro, Rosemount TankRadar 2900, Rosemount TankRadar 3900, FCU 2160, FCU 2165, IDAU, SDAU

Open system solution enables integration of other vendor’s systems

**OPC server with browser**

Rosemount TankMaster uses OPC Data Access 2.0 (OLE for Process Control), an open industry standard, which eliminates the need for costly customized software integration.

With the OPC server and the browser it is possible to import all custody transfer and inventory data to other OPC clients such as different DCSs, PLCs, Scada systems, or Microsoft Office programs.

(Website OPC Foundation: [OPCfoundation.org](http://OPCfoundation.org))

Connection to other systems

The Rosemount tank gauging system can be connected to all major suppliers of DCS, SCADA systems, plant host computers or terminal automation systems. The connection can be made in two ways:

- To a TankMaster PC workstation
- Directly to a Rosemount 2460 System Hub

The advantage of connecting to a TankMaster workstation is that not only the measured values, but also the values calculated by the TankMaster can be communicated.

Figure 4. TankMaster Connections to Other Systems

Emulation

It is possible to seamlessly replace other tank management systems with Rosemount TankMaster. Data from different types of units is collected and displayed.
Redundancy

In order to reduce the risk of communication failure between the TankMaster/DCS system and the units connected to the Tankbus, redundancy can be made in several ways.

**Redundant TankMaster PC:s**

A system can have two redundant TankMaster PCs connected via two different group buses to one or several Rosemount 2460 System Hubs.

There are two possible TankMaster configurations:
- Both PC:s active, and separately asking for data
- One primary active PC, and the other silent in backup mode (hot standby)

**Redundant Rosemount 2460 System Hubs**

The system hub can provide redundancy for critical operations, by using two identical devices.

The primary system hub is active and the other one is in passive mode. If the primary unit stops working properly the secondary unit is activated and a failure message is sent to TankMaster (or a DCS system).

**Complete control room redundancy**

Complete field to control room redundancy is achieved by using redundant Rosemount 2460 System Hubs, Rosemount 2180 Fieldbus Modems, and TankMaster PCs.

**Tankbus and field network redundancy**

It is possible to have two Rosemount 2410 Tank Hubs with two separate Tankbuses on the same tank.

All field devices can also be configured in pair:
- Double level measurement devices
  (two separate gauges or a 2-in-1 gauge)
- Double temperature transmitters with associated sensors
- Double liquid pressure transmitters

![Figure 5. Fully Redundant System](image-url)
Modbus TCP communication

TankMaster supports Modbus TCP communication to the Rosemount 2460 System Hub. Existing plant network can be used for connections between TankMaster and one or several system hubs.

Using Ethernet communication greatly increases communication speed and reduces wiring complexity especially in large redundant tank gauging systems.

Tank inventory calculator

The tank inventory calculator is a tool that calculates inventory values based on operator entered input values and the selected tank configuration. Input value fields are initiated with the current tank configuration and input values from devices. The operator can then change some or all input values and press the “Calculate” button to calculate inventory values.

Tank transfer calculator

A tool for the operator to calculate transferred product values or closing values using inventory parameters.

Note

TankMaster redundancy requires two Modbus TCP client connections in each Rosemount 2460 System Hub.
Software packages

- **WinOpi** is a complete custody transfer and inventory software package. All calculations are based on current API and ISO standards. Configuration of the Rosemount Tank Gauging system is made with **WinSetup**, which is included in the delivery.

- **WinView** is a software package with basic inventory capabilities. It is a cost-efficient alternative for operational control at smaller tank terminals, marketing terminals, biofuels and chemical plants, etc. Configuration is made with **WinSetup**, which is included in the delivery.

See Table 2 and Table 3, for further information.

**Table 2. Available Features, WinOpi and WinView**

<table>
<thead>
<tr>
<th>Feature</th>
<th>WinOpi</th>
<th>WinView</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarms</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Host communication, Modbus, and OPC</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Custody transfer</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>API tables</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Batch handling</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Reports</td>
<td>Yes</td>
<td>Yes, partly</td>
</tr>
<tr>
<td>Translation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TankMaster network support</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Customization</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Create new group of tanks</td>
<td>Yes</td>
<td>No(1)</td>
</tr>
<tr>
<td>Proof tests</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Roof monitoring</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Redundancy</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>HTG (hydrostatic tank gauging)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hybrid tank gauging</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Historical function</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Table 3. Supported Data Parameters, WinOpi and WinView**

<table>
<thead>
<tr>
<th>Supported (measured or calculated) data parameters</th>
<th>WinOpi</th>
<th>WinView</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ullage</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Level rate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Flow rate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Average temperature</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Spot temperature</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Vapor temperature</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Air temperature</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Free water level</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Free water volume</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Total observed volume (TOV)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Gross observed volume (GOV)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Gross standard volume (GSV)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Net standard volume (NSV)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Vapor, liquid, and air pressure</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Observed density</td>
<td>Yes</td>
<td>Yes, manually entered</td>
</tr>
<tr>
<td>Reference density</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mass calculations</td>
<td>Yes</td>
<td>Yes, limited</td>
</tr>
</tbody>
</table>

1. Possibility to edit existing group (“All tanks”).
Proof test manager

TankMaster includes a proof test manager which allows operators to perform proof test of Rosemount Tank Gauging overfill prevention systems safely, and remotely from the control room. The continuous product level monitoring can be combined with proof testing at regular intervals.

The proof test manager provides a number of different tests:
- high level alarm verification using a reference reflector
- high level alarm verification with simulated reference reflector
- One-point level verification by hand-dipping to verify automatic level measurements
- analog output verification
- relay output verification

A step by step proof test wizard guides the user through selected tests.

Once the selected proof tests are done, a summary will show a list of tests which have been performed and the results.

Proof test report

When the proof test is finished and approved, a test report is automatically created.

The test report includes field device specific information for identification, detailed test results, when the test was performed, who performed the test, and who approved it.

Proof test history

All proof test reports can easily be displayed on a later occasion using the proof test history option.

Proof test scheduling

The proof test scheduling option lets the user specify when the next proof test should be performed. You may also set the test frequency and the desired type of reminder: Pop-up message and/or Email.
Floating roof monitoring

The status of a storage tank’s floating roof is monitored by this function. It can detect if the roof is tilting, sinking, or if the roof is floating higher/lower than normal.

Level radars are installed at multiple points, spaced evenly around the perimeter of the roof. The following installation alternatives are available:

- Shell mounted with/without level reference
- Roof mounted

See Table 4 for detailed information about the installations.

Drain sump monitoring and hydrocarbon detection

A drain gauge and/or a hydrocarbon gauge can be added to the floating roof monitoring system.

The drain gauge is installed in the drain sump and detects if the drain clogs and water does not run off. Rosemount 3308 Wireless Guided Wave Radar or Rosemount 2160 Wireless Vibrating Fork can be used for drain sump monitoring.

Installed at the floating roof, the hydrocarbon gauge detects potential hydrocarbons on the roof. Typically, the Rosemount 702 Wireless Discrete Transmitter with Liquid Hydrocarbon Detection is used.

Figure 9. Floating Roof System with Shell Mounted and Roof Mounted Radar Devices

Table 4. Floating Roof Tank Installation Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Shell mounted with/without level reference</th>
<th>Roof mounted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radar device</td>
<td>Rosemount 5900C Non-Contacting Radars</td>
<td>Rosemount 3308 Wireless Guided Wave Radars</td>
</tr>
<tr>
<td>Number of radar devices</td>
<td>Minimum three, maximum six</td>
<td>Minimum three, maximum six</td>
</tr>
<tr>
<td>Installation</td>
<td>Installed at top of tank shell(1)</td>
<td>Directly on floating roof</td>
</tr>
<tr>
<td></td>
<td>Also suitable for fixed roof tanks with inner floating roof</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>Measures distance to the floating roof</td>
<td>Measures distance to the liquid</td>
</tr>
<tr>
<td>Tilt</td>
<td>Tracks tilt by comparing measured distance from radars to the floating roof</td>
<td>Tracks tilt by comparing measured distance to the liquid</td>
</tr>
<tr>
<td>Roof floating</td>
<td>Tracks roof floating high/low by referencing liquid surface(2)</td>
<td>Tracks roof floating high/low by measuring distance to the liquid</td>
</tr>
<tr>
<td>Possible alerts/alarms</td>
<td>■ Roof tilt</td>
<td>■ Roof tilt</td>
</tr>
<tr>
<td></td>
<td>■ Roof floating high/low(2)</td>
<td>■ Roof floating high/low</td>
</tr>
<tr>
<td></td>
<td>■ Drain sump full with water(3)</td>
<td>■ Drain sump full with water(3)</td>
</tr>
<tr>
<td></td>
<td>■ Hydrocarbons detected(4)</td>
<td>■ Hydrocarbons detected(4)</td>
</tr>
<tr>
<td>Data transmission to control room</td>
<td>Wired connection from level gauge to tank hub</td>
<td>Wired communication from tank hub to control room</td>
</tr>
</tbody>
</table>

1. Local site license may be required for compliance to frequency spectrum approval.
2. Requires level reference (inventory level gauge in still-pipe).
3. Requires drain sump gauge.
4. Requires hydrocarbon detection gauge.
Graphical overview of floating roof status

TankMaster provides a visual status overview of the floating roof tank together with detailed values for roof floating, roof tilt, and roof drain sump. If an alarm is generated, it is also visible here. A detailed view provides the user with additional information for each tilt gauge, see Figure 10. History of maximum tilt and maximum/minimum roof floating deviation values are also displayed with corresponding time and tank level.

**Figure 10. Detailed View – Roof Floating Higher Than Normal**

A group summary view displays an overview showing the current mode of all floating roofs, as shown in Figure 11. The user customizes the view with desired parameters such as: Roof status, level, roof tilt, roof floating, roof drain, and hydrocarbons.

**Figure 11. Group Summary View of Floating Roof Tanks**
Hardware requirements

The following minimum system specification is required for TankMaster version 6.E1(1):

Table 5. Hardware requirements

<table>
<thead>
<tr>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TankMaster PC Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
</tr>
<tr>
<td>Internal Memory (RAM)</td>
</tr>
<tr>
<td>■ 4 GB: (32-bit OS)</td>
</tr>
<tr>
<td>■ 8 GB: (64-bit OS)</td>
</tr>
<tr>
<td>Hard Disk Drive (HDD) or Solid State Drive (SSD)</td>
</tr>
<tr>
<td>■ TankMaster + SQL Server 2005 Express needs approximately 600 MB</td>
</tr>
<tr>
<td>Monitor</td>
</tr>
<tr>
<td>USB port</td>
</tr>
<tr>
<td>Minimum 2 ports.</td>
</tr>
<tr>
<td>■ One port for hardware key.</td>
</tr>
<tr>
<td>■ One port for protocol channel. Each protocol channel requires one port(1)(2).</td>
</tr>
<tr>
<td>Hardware license key</td>
</tr>
<tr>
<td>FBM(2)</td>
</tr>
<tr>
<td>Network Interface Card (NIC)</td>
</tr>
</tbody>
</table>

1. Serial ports RS-232 and RS-485 are also supported.  
2. Not required for communication via Modbus TCP.

Note
A hardware key is **not** required to run WinSetup but is required for installing tanks.

Software requirements

**Operating system**(2)

- Windows 7 Professional (32- and 64-bit) service pack 1 (SP 1)  
- Windows 10 version 1803, 1809 (64-bit recommended)  
- Windows 2012 Server R2  
- Windows 2016 Server

**Networking**

TankMaster network clients require a minimum bandwidth of 10 Mbit/s.  
All TankMaster server and client PCs in the network must have the same TankMaster version.

1. For previous TankMaster versions other system requirements apply. Please contact Emerson Process Management/Rosemount Tank Gauging for more information.  
2. English version.
Global Headquarters and Europe Regional Office
Tank Gauging
Emerson Automation Solutions
Box 150
(Visiting address: Layoutvägen 1)
SE-435 23 Mönlycke
Sweden
+46 31 337 00 00
+46 31 25 30 22
Sales.RTG@Emerson.com

North America Regional Office
Tank Gauging
Emerson Automation Solutions
6005 Rogerdale Road
Mail Stop NC 136
Houston, TX 77072, USA
+1 281 988 4000 or +1 800 722 2865
Sales.RTG.HOU@Emerson.com

Latin America Regional Office
Emerson Automation Solutions
1300 Concord Terrace, Suite 400
Sunrise, FL 33323, USA
+1 954 846 5030
+1 954 846 5121
RMTLAContactUS@Emerson.com

Asia Pacific Regional Office
Emerson Automation Solutions
1 Pandan Crescent
Singapore 128461
+65 6777 8211
+65 6777 0947
Specialist-OneLevel.RMT-AP@Emerson.com

Middle East and Africa Regional Office
Emerson Automation Solutions
Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone - South 2
Dubai, United Arab Emirates
+971 4 8118100
+971 4 8865465
RTGMEA.Sales@Emerson.com

Emerson Terms and Conditions of Sale are available upon request.
The Emerson logo is a trademark and service mark of Emerson Electric Co. Rosemount is a mark of one of the Emerson family of companies. All other marks are the property of their respective owners. © 2019 Emerson. All rights reserved.