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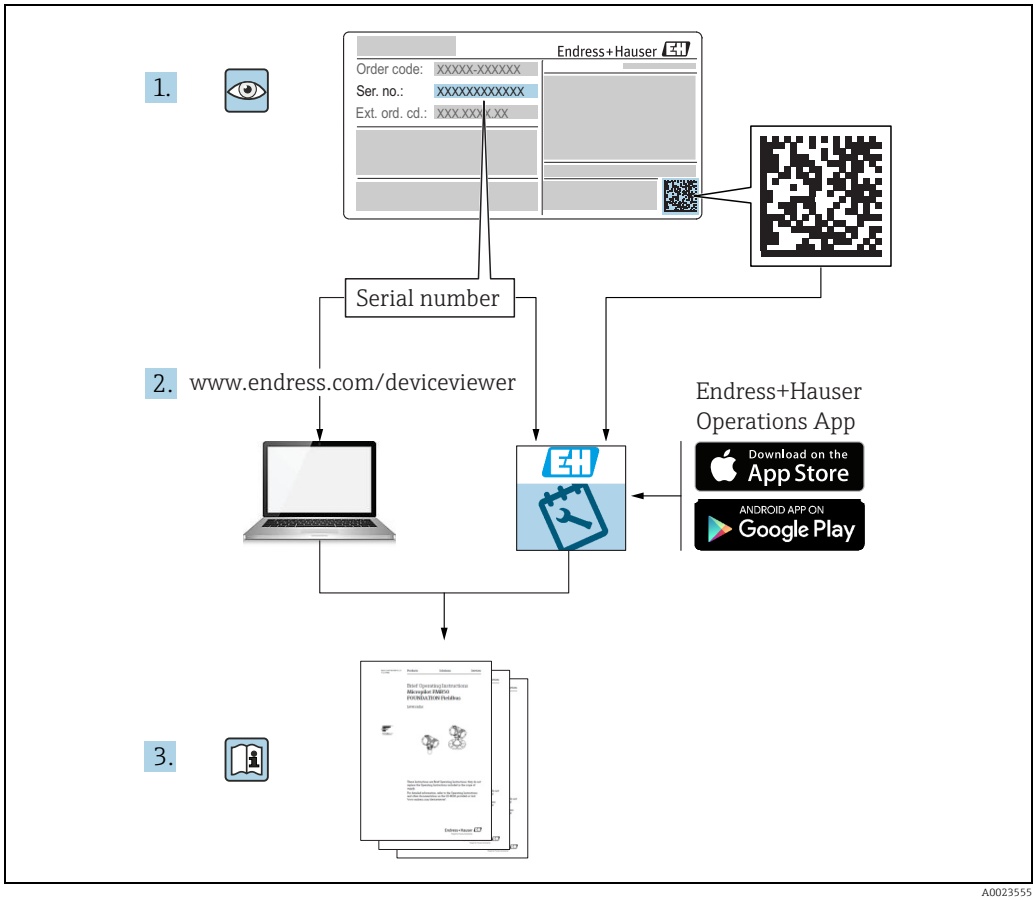
Valid as of software version:
18.3.1

Operating Instructions
Tankvision Professional NXA85
Tankvision LMS NXA86

Legacy OPC Tank Data Servers

Endress+Hauser
People for Process Automation



Make sure the document is stored in a safe place such that it is always available when working on or with the device.
To avoid danger to individuals or the facility, read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures.
The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Instructions.

Change history

Document version	Valid for SW version	Changes to the previous version
BA01293G/00/EN/04.17	18.1.1	Unification of the W&M and the non W&M software packages.
BA01293G/00/EN/05.18	18.1.1	Compatibility with Windows 10 and Windows Server 2016
BA01293G/00/EN/05.18	18.2.5	Additional data items and tank parameters
BA01293G/00/EN/07.20	18.3.1	Content added: Cross-reference to the OPC UA Server manual for up-to-date information

Table of Contents

1 About this document

1.1 Document function

This manual should support during the configuration of Tankvision Professional NXA85 and LMS NXA86. It deals with the configuration steps to setup the OPC Data Access Server of Tankvision Professional/LMS.
It is recommended receiving a training on the system by Endress+Hauser.

1.2 Software versions and certification

Due to the certification process with weights and measures agencies, the latest software version might only be certified at a later stage. Also some features might be incompatible with the weights and measure regulations and can therefore not be combined.

1.3 Symbols

1.3.1 Safety symbols

Symbol	Meaning
DANGER A0011189-EN	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING A0011190-EN	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION A0011191-EN	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE A0011192-EN	**NOTICE!** This symbol contains information on procedures and other facts which do not result in personal injury.

1.3.2 Electrical symbols

Symbol	Meaning
 A0011197	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
 A0011198	**Alternating current** A terminal to which alternating voltage is applied or through which alternating current flows.
 A0011200	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 A0011199	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.

1.3.3 Symbols for certain types of information

Symbol	Meaning
 A0011193	**Tip** Indicates additional information.
 A0011195	**Reference to page** Refers to the corresponding page number.
1. , 2. , 3. ...	Series of steps
✔ A0018373	Result of a sequence of actions

1.3.4 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, **B**, **C** ...	Views
 A0011187	**Hazardous area** Indicates a hazardous area.
 A0011188	**Indicates a non-hazardous location** Safe area (non-hazardous area)

1.4 Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- W@M Device Viewer (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

2 Identification

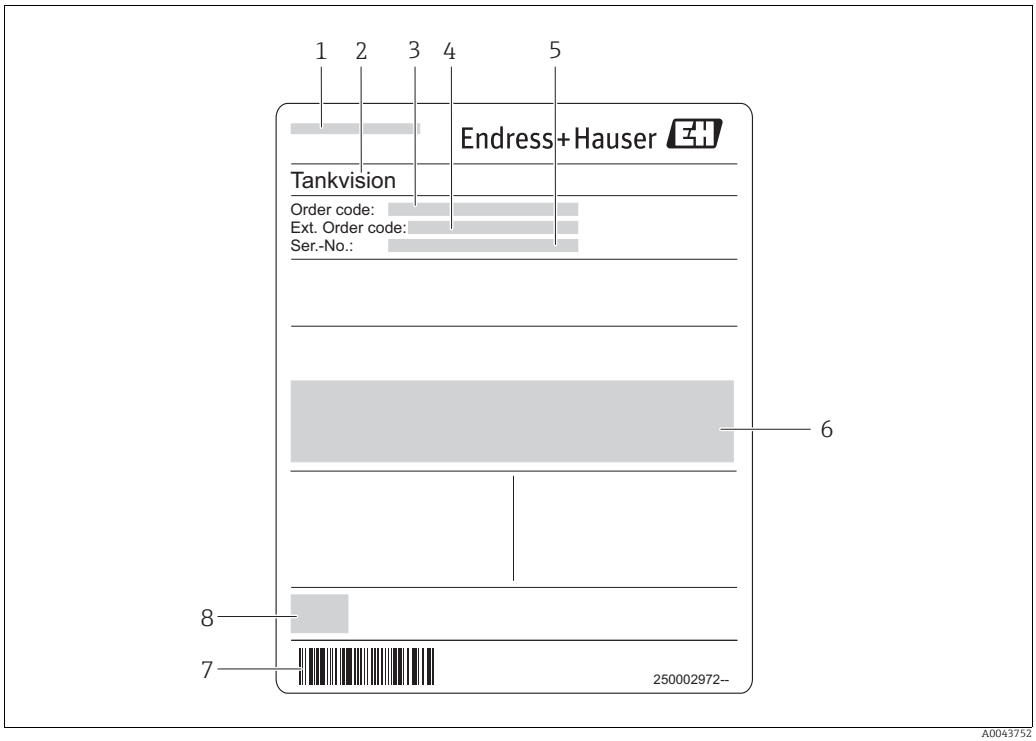
2.1 Product identification

The following options are available for identification of the software:

- Nameplate specifications
- Order code with breakdown of the software features on the delivery note
- Enter serial numbers from nameplates in W@M Device Viewer (www.endress.com/deviceviewer): All information about the software is displayed.

For an overview of the technical documentation provided, enter the serial number from the nameplates in the W@M Device Viewer (www.endress.com/deviceviewer)

2.2 Nameplate



1 *Address of manufacturer*
2 *Product name*
3 *Order code*
4 *Extended order code (Ext. ord. cd.)*
5 *Serial number (Ser. no.)*
6 *Certificate and approval relevant data*
7 *Barcode*
8 *CE mark*

2.3 Order code and device version

To find out the version of your software, enter the order code indicated on the nameplate in the search screen at the following address:
www.products.endress.com/order-ident

2.4 Product documentation

The information required to retrieve the documentation can be found on the nameplate of the device.

Technical documentation can also be downloaded from the Download Area of the Endress+Hauser web site: www.endress.com→ Download. However this technical documentation applies to a particular instrument family and is not assigned to a specific device.

2.4.1 W@M Device Viewer

1. Launch the W@M Device Viewer: www.endress.com/deviceviewer
2. Enter the serial number (Ser. no.) of the device: see nameplate.
   ↳ All the associated documentation is displayed.

2.4.2 Endress+Hauser Operations App

The *Endress+Hauser Operations App* is available both for android smart phones (Google Play Store) and for iPhones and iPads (App Store).

Via the serial number:

1. Launch the *Endress+Hauser Operations App*.
2. Enter the serial number (Ser. no.) of the device: see nameplate.
   ↳ All the associated documentation is displayed.

2.5 Registered trademarks

Microsoft®, Windows® and Internet Explorer®
Registered trademarks of the Microsoft Corporation

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3 Basic safety instructions

3.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- Trained, qualified specialists: must have a relevant qualification for this specific function and task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations
- Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates
  (depending on the application)
- Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- Being instructed and authorized according to the requirements of the task by the facility's owner operator
- Following the instructions in these Operating Instructions

3.2 IT security

A warranty on our part can only be provided if the software application is installed and used as specified in the operating manual. The software application contains safety mechanisms to protect it against inadvertent changes to the software settings.
IT security measures that are in accordance with the operator's safety and security standards and designed to additionally protect the software application and the transfer of data must be implemented by the operator.

3.3 Intended use

3.3.1 Application

Tankvision Professional NXA85

Tankvision Professional is specifically designed for operators of bulk storage facilities, marketing terminals, refineries and pipelines. It is designed to handle all the data acquisition, supervisory control and monitoring required in a single fully integrated solution.

Tankvision Professional integrates all major types of tank measurement instruments into one system.

All measured and calculated tank parameters are accessible to your tank farm and terminal operators as well as to connected host systems.
Multi-user operation is provided by the inbuilt Web Server offering the opportunity to access data at any connected location (local/remote) e.g. for administrative and accounting purposes.

Tankvision LMS NXA86

Tankvision LMS is a total LNG Tank Storage and Management solution for Peak Shaving, Receiving and Production LNG facilities. The LMS system has been designed to interface to all instruments commonly found on LNG storage tanks, and to collect and present the instrument data through a range of intuitive graphical user interfaces. A typical LNG Tank will have a wide range of measurement instruments to measure Liquid Level, Liquid Density,

Liquid and Vapour Temperature, Liquid and Vapour Pressure, Skin Temperature and much more.

Typically each tank would be fitted with an LTD gauge, two further level gauges configured as a Primary and Secondary, and an Alarm Gauge. The LTD gauge is a servo operated unit mounted on the tank roof. The purpose of the LTD gauge is to take accurate profiles of temperature and density throughout the liquid, and whilst not profiling provide continuous liquid level, temperature and density measurement. The Primary and Secondary gauges can be either servo and or radar operated units also mounted on the tank roof. The purpose of these gauges is to provide continuous liquid level measurement, and average liquid temperature measurement. They provide redundancy on the measurement of level and temperature. The average liquid temperature is derived from a multipoint temperature sensor device. The alarm gauge is often a servo or radar based gauge configured to provide volt free contact alarm status to an independent system.

An LMS system can operate in a simple standalone configuration or as a fully redundant system where security and integrity are of paramount importance. The LMS system has a flexible and scalable architecture allowing it to be tailored to a number of different applications easily.

4 Introduction

Although the OPC functionality described in this manual is still operational, it has now been superseded by a new UA only OPC server. Please **refer to the OPC UA Server manual** for details.

The Tankvision Professional system includes OPC data server functionality which allows users to access data items in the tank gauging system. There are two OPC servers available which are installed as windows services:

DCC OPC Tank Data Server
- OPC data server with DA functionality

DCC OPC UA Tank Data Server
- OPC data server with UA functionality

The servers allows access to data in the Real-Time database of our Tank Management systems for such items as live tank data, configuration data and profile data. Gauges may also be controlled via the device commands items in the **OPC Server**.
Multiple OPC clients may be connected simultaneously to each server, up to the maximum limit defined in the run-time license purchased by the user.

5 Installation

5.1 Main installation

The **OPC Data Access Servers** are installed as standard with all our Tank Management systems but will only allow clients to connect to live data with the correct licensing details. In addition to OPC servers, a set of OPC Component files provided by the OPC foundation will be installed on the system.

Installed OPC Component files
- OPC Core Components
  Support files for OPC-DA functionality
- OPC UA Local Discovery Server
  Provides a windows service which permits discovery of installed OPC-UA servers

5.2 OPC-DA Server Post-Installation

The OPC-DA server requires correct configuration of Windows DCOM security settings. This is an advanced topic which is beyond the scope of this manual and should be referred to a suitably qualified Windows administrator.

5.3 OPC-UA Server Post-Installation

The OPC-UA server relies on Windows certificates to provide secure connections between clients and servers. This is somewhat simpler than the security model of DA-type servers. The certificate configuration should be carried out by a suitably qualified Windows administrator.

Certification Requirements
- The OPC UA Local Discovery Server certificate must be imported into the Windows certificate store. The certificate is located at:
  C:\ProgramData\OPC Foundation\UA\pki\own\certs\ualdscert.der
- A certificate must be produced for the OPC-UA server and copied into the LDS trusted servers certificate folder at:
  C:\ProgramData\OPC Foundation\UA\pki\trusted\certs
  The certificate is produced referencing the OPC-UA server configuration file.
- Each client wishing to connect must trust the server certificate created in the previous point. This can be achieved by importing the server certificate into the client's trusted root certificate store.

A powershell script named **PrepareUaServer.ps1** in the C:\Program Files\Endress+Hauser\Tankvision Professional\ folder is supplied to simplify the process if required.

This script carries out the following actions:

1. Create a certificate for the OPC-UA server
2. Configure the firewall to allow connections
3. Copy the created certificate into the LDS trusted servers folder
4. Import the LDS certificate into the Windows certificate store

As specified above, each client wishing to connect to the OPC-UA server must trust the server certificate.

6 Configuration

6.1 Data Scanning

The client is free to set the update rates, deadbands, etc., but as some data changes only rarely there are some recommendations which should be taken into account.

The data sections **Tank Parameters**, **Status Bits** and **Calculated Parameters** all contain data items that may change regularly and thus should be on a relatively high update rate, possibly as low as every 5 seconds.

The section **Profile Data** contains data that will only change when a new profile has been carried out and thus should have a much lower update rate or be updated on demand only.

The sections **Alarm Setpoints**, **Gauge Configuration Items**, **Tank Configuration Items**, **Inventory Configuration Items** and **WmStatus** contain data items that only change when the user enters new data and should be not be updated regularly.

The sections **Port Data** and **System** contain a mixture of live and configuration data. The update rate for each tag should be considered when connecting a client.

6.2 Server Configuration

6.2.1 Server Configuration

The OPC server can be configured by editing the associated configuration file. This file is named **TankGauging.OPC.Server.exe.config** and is located in the C:\ProgramFiles\Endress+Hauser\Tankvision Professional\ folder.
The configurable items are as follows:

OPC server operation

- **TagDefinitionsSource**
  Default: **Default**
  This option defines the OPC 'map' of data item tags.
  The available modes are:
  Default - Default tags as defined in this manual
  Legacy - The tags as defined in previous versions of the software
  < path_to_xml_file > - Tags will be configured als defined in the xml file. See section Tag configuration.
- **ErrorMode**
  Set the OPC quality setting method. See section Globals.
- **LoggingLevel**
  The logging level.
  Default: **Error**
  This can be any of:
  – Verbose (0)
  – Information (2)
  – Error (4)
  Information and Error logging is written to C:\ProgramData\Tank Farm Automation\Common\Logs\OpcDataLog.log whilst Verbose logs are written to C:\ProgramData\Tank Farm Automation\Common\Logs\OpcLog.log

Value calculation

In addition to configuring units as described in section Tag Configuration, the user can specify multipliers and additions to be applied to values to scale or convert them. These are applied after any unit conversion is carried out. The value displayed is calculated as follows: (value_in_configured_units value_type_multiplier) + value_type_addition

- **LevelMultiplier**
  Default value: **1**
- **LevelAddition**
  Default value: **0**
- **TemperatureMultiplier**
  Default value: **1**
- **TemperatureAddition**
  Default value: **0**
- **DensityMultiplier**
  Default value: **1**
- **DensityAddition**
  Default value: **0**
- **PressureMultiplier**
  Default value: **1**
- **PressureAddition**
  Default value: **0**
- **VolumeMultiplier**
  Default value: **1**
- **VolumeAddition**
  Default value: **0**
- **MassMultiplier**
  Default value: **1**
- **MassAddition**
  Default value: **0**

Tag naming

Most parts of a tag address can be configured. The exceptions are items in the global namespace, tank names and port numbers.

- **TankPrefixText**
  Default Tanks (**Tanks**.TK001.Primary.Alarm.....)
- **TankConfText**
  Default Tank Configuration Items (Tanks.TK001.Primary.**Tank Configuration Items**.....)
- **InvConfText**
  Default Inventory Configuration Items (Tanks.TK001.Primary.**Inventory Configuration Items**.....)
- **GaugeConfText**
  Default Gauge Configuration Items (Tanks.TK001.Primary.**Gauge Configuration Items**.....)
- **AlarmSetpointText**
  Default Alarm Setpoints (Tanks.TK001.Primary.**Alarm Setpoints**.....)
- **DeviceCommandText**
  Default Device Commands (Tanks.TK001.Primary.**Device Commands**.....)
- **CalcParmsText**
  Default Calculated Parameters (Tanks.TK001.Primary.**Calculated Parameters**.....)
- **ProfileDataText**
  Default Profile Data (Tanks.TK001.Primary.**Profile Data**.....)
- **StatusBitsText**
  Default Status Bits (Tanks.TK001.Primary.**Status Bits**.....)
- **TankParamsText**
  Default Tank Parameters (Tanks.TK001.Primary.**Tank Parameters**.....)
- **WmStatusText**
  Default WmStatus (Tanks.TK001.Primary.**WmStatus**.....)

- **SystemText**
  Default System (**System**.....)
- **PortDataText**
  Default Port Data (**Port Data.99**.....)

The name for the device type on a tank can also be configured.

- **PrimaryText**
  Default Primary (Tanks.TK001.**Primary**.....)
- **SecondaryText**
  Default Secondary (Tanks.TK001.**Secondary**.....)
- **BackupText**
  Default Backup (Tanks.TK001.**Backup**.....)
- **LTDText**
  Default Densitometer (Tanks.TK001.**Densitometer**.....)
- **AuxiliaryText**
  Default Auxiliary (Tanks.TK001.**Auxiliary**.....)
- **BackupLTDText**
  Default Backup Densitometer (Tanks.TK001.**Backup Densitometer**.....)
- **GenericDeviceText**
  Default Generic Device (Tanks.TK001.**Generic Device**.....)

6.3 Tag Configuration

The **OPC tag map** is determined by the setting of the **TagDefinitionsSource** key in the server configuration file. If an xml configuration file is supplied then opc tags can be disregarded, duplicated, renamed and have customised units. A full listing of the default xml definitions is shown in the appendix. The elements of the xml configuration file are explained below.

6.3.1 TagType

- Each **<TagItem ... />** entry will be displayed as an OPC data tag.
- Each **TagItem** has a **TagType** - this defines the internal type of the tag and cannot be edited.
- Unrecognised **TagTypes** will be disregarded.
- Duplicates are permitted if the **DisplayNames** are different. For example, if a value needs to be displayed in 2 distinct units.

6.3.2 DisplayName

- Each **TagItem** can be configured with a custom tag name.
- The parent xml node which contains the **TagItem** represents the position in the **OPC map** hierarchy at which the item will be displayed. This position cannot be configured and **TagItems** in the wrong section will be disregarded.
- The parent node corresponds to the portion of the address, see Section Server Configuration.

6.3.3 Units

The units for data items which support units can be configured.
Units which are unsupported for the data item will be disregarded and a default setting will be used.

Available units are:

- **Level**
  mm - millimetres
  m - metres
  in - inches

ft - feet
f_i_s - feet_inches_sixteenths
f_i_t - feet_inches_tenths

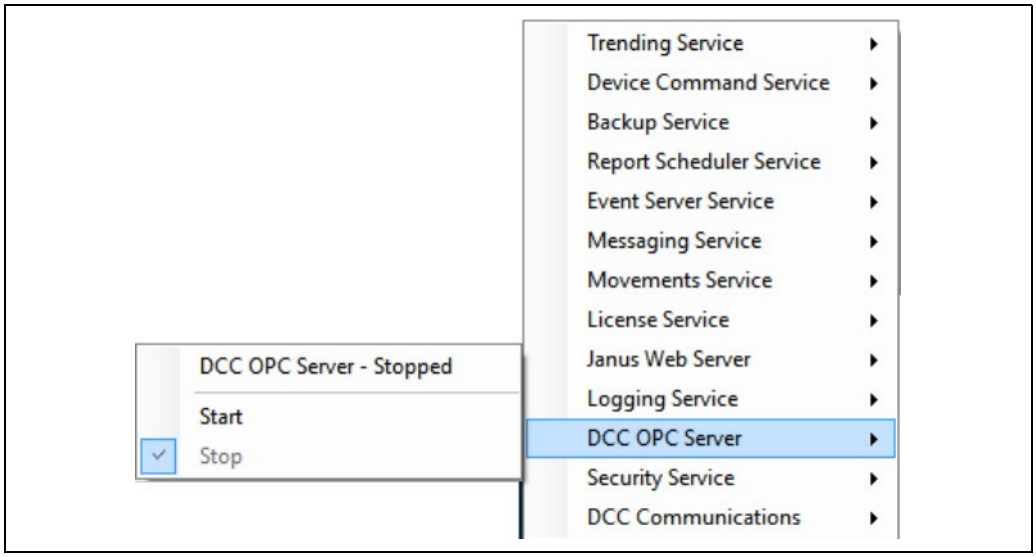
- **Temperature**
  Deg.C- degrees Celcius
  Deg.F - degrees Fahrenheit
  F(rel) - degrees Fahrenheit (relative)
  K - degrees Kelvin
- **Density**
  kg/l - kilograms per litre
  sg - specific gravity (using Dwater 0.999012 kg/l)
  sg(new) - specific gravity (using Dwater 0.999016 kg/l)
  API - degrees API (using Dwater 0.999012 kg/l)
  API(new) - degrees API (using Dwater 0.999016 kg/l)
  kg/m3 - kilograms per cubic meter
  g/cm3 - grams per cubic centimetre
  t/l - tonnes per litre
  t/m3 - tonnes per cubic metre
  lb/ft3 - pounds per cubic foot
  lb/gal - pounds per imperial gallon
  lb/gal(US) - pounds per US gallon
- **Pressure**
  bar_a - bar absolute
  bar_g - bar relative
  kg/cm2 - kilograms per square centimetre
  kg/m2 - kilograms per square metre
  kPa - kilo-Pascals
  Pa - Pascals
  PSIa - pounds per square inch absolute
  PSIg - pounds per square inch relative
- **Volume**
  l - litres
  m3 - cubic metres
  ft3 - cubic feet
  Bbls - barrels
  gal - imperial gallons
  gal(US) - US gallons
  kl - kilo-litres
- **Mass/Weight**
  kg - kilograms
  t - tonnes
  T - imperial Tons
  lb - pounds
  ST - Stones
  g - grams
- **Level Flow Rate**
  mm/min - millimetres per minute
  mm/hr - millimetres per hour
  m/min - metres per minute
  m/hr - metres per hour
  in/min - inches per minute
  in/hr - inches per hour
  ft/min - feet per minute
  ft/hr - feet per hour
- **Volume Flow Rate**
  l/min - litres per minute
  l/hr - litres per hour
  m3/min - cubic metres per minute
  m3/hr - cubic metres per hour

Bbls/min - barrels per minute
Bbls/hr - barrels per hour
gal/min - imperial gallons per minute
gal/hr - imperial gallons per hour
gal(US)/min - US gallons per minute
gal(US)/hr - US gallons per hour
kl/hr - kilo-litres per hour

- **Mass Flow Rate**
  kg/min - kilograms per minute
  kg/hr - kilograms per hour
  t/min - tonnes per minute
  t/hr - tonnes per hour
  T/min - imperial Tons per minute
  T/hr - imperial Tons per hour

7 Starting / Stopping the OPC Server

The **OPC Data Access Servers** run as a system services, and will be automatically started when a client attempts to connect. However, they may be manually stopped or started using the service manager utility in the Windows System Tray.



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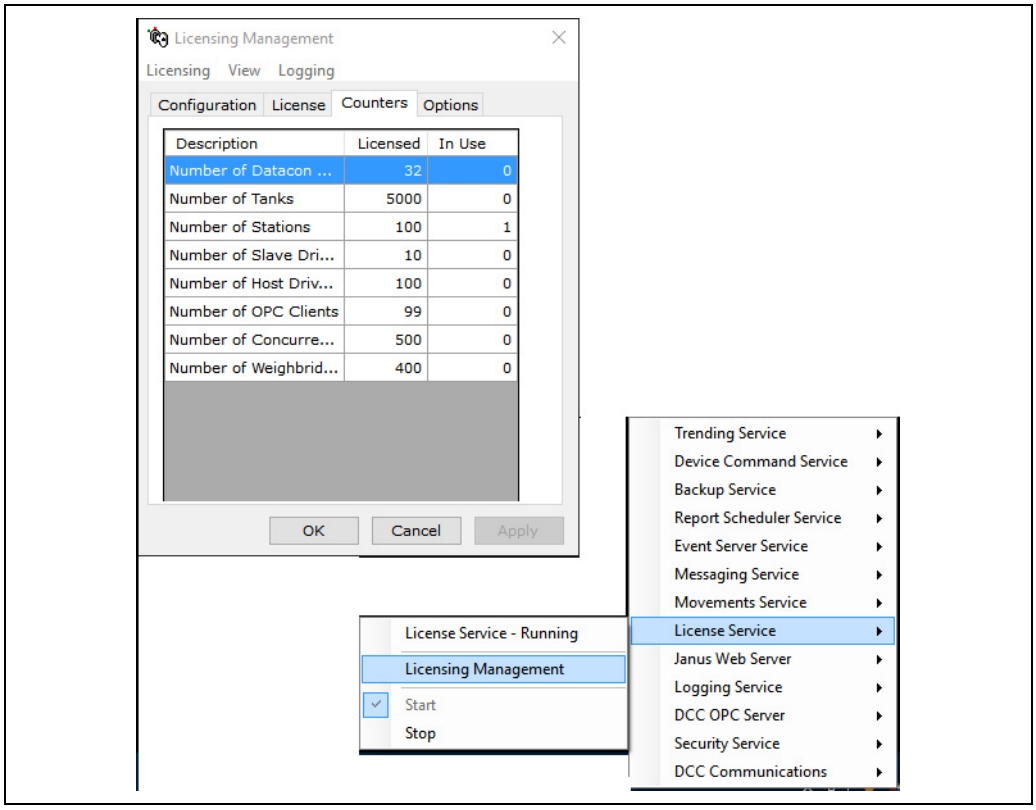
8 OPC Client Licensing

- The **OPC Data Access Server** will allow multiple OPC clients to connect simultaneously.
- Any number of clients may browse the OPC namespace. The number of currently browsing clients is shown in **Globals.Connected Clients**.
- A number of clients up to a limit defined in the licensing details for the site may read data from the OPC server. The number of connected clients reading data is shown in **Globals.Connected Data Clients**.
- The number of connected data-reading clients is checked every 15 minutes.
  - In the first instance, if the number of connected data clients exceeds the license count then the OPC tag **Globals.License Count Exceeded** is set to true.
  - If the license count remains exceeded at the second check then the OPC server is shut down.

1. To view the licensing details, run the **License Management** tool from the Windows System Tray and select the **Counters** tab.



The maximum number of concurrent OPC clients allowed is also shown in the OPC tag **Globals.Max Data Clients.**

9 OPC Server Namespace

Both the DA and UA versions of the OPC server are named **Tank Data Server**.
All data parameters from the Tank Gauging database (Levels, Temperatures, Volumes, etc.) are structured in a namespace in the **OPC Server**, which may be configured as described in the configuration chapter.
This namespace can then be used by **OPC Clients** to access any data parameters they require.
Individual data items are detailed in the **Data Items** chapter.

9.1 Globals

There is always 1 fixed section in the namespace, called Globals. This contains items which do not apply to an individual tank, but to the system as a whole.

Globals.GlobalDataItem

9.2 Tank Data Items

Tank data items are grouped in a hierarchy. The hierarchy depends on the tag definitions configured.
In the case of a Legacy configuration this is:
< TankName > .GaugeDuty.DataSection.TankDataItem

For the default configuration this is:
Tanks. < TankName > .GaugeDuty.DataSection.TankDataItem

9.2.1 Tank Name

The tank name will be as per the tank name in the tank gauging database, with a maximum length of 12 characters.

9.2.2 Gauge Duty

Each tank may have multiple gauges installed, with each gauge being configured as a different duty. Gauges may be configured with one of the following duties:

- **Primary** – the main gauge on the tank, used to calculate tank volumes, weights etc. A tank MUST have a primary gauge configured.
- **Secondary** – reserve gauge which is mainly used to check against the primary gauge values for levels, temperatures, etc.
- **Backup (Alarm)** – used to generate HiHi level shutdown alarms
- **LTD** – an advanced gauge used on LNG systems to carry out density profiles
- **Auxiliary** – auxiliary gauges
- **Backup LTD** – backup LTD gauge
- **Generic Device** – generic devices (such as pumps, valves, etc)

Because there may be more than one auxiliary gauge or generic device, these devices are appended with the system internal gauge number to distinguish them.

A tank will **always** have a primary gauge configured, whereas the other gauges are optional. LNG systems will typically have all four gauges installed on each tank.

9.2.3 Data Section

The **Data Section** nodes are there simply to split the list of data items into logical sections of related **Data Items**, to improve user friendliness. The **Data Section** nodes currently supported per gauge are:

- **WM Status** - only in non-Legacy mode. Shows the weights and measures status values
- **Tank Configuration Items** - tank operating mode/status
- **Tank Parameters** - live data usually from the gauge
- **Status Bits** - gauge status bits, alarms etc.
- **Profile Data** - profile data tables from the gauge
- **Calculated Parameters** - volumes. mass etc.
- **Device Commands** - for sending commands to the device
- **Alarm Setpoints** - alarm setpoints used to generate software alarms
- **Gauge Configuration Items** - configuration data
- **Inventory Configuration Items** - configuration data used for volumes

9.3 Port Data Items

Port data items are only available when the server is **not** running in Legacy mode. The items are grouped in a hierarchy which is:
Ports. < PortNumber > .PortDataItem

9.4 System Data Items

System data items are only available when the server is **not** running in Legacy mode. The items are grouped in a hierarchy which is:
System.SystemDataItem

9.5 General information

9.5.1 Data Item

Each **Data Item** is a parameter from the Tank Gauging database and may be a level, temperature, density, volume or other similar parameter. The list of Data Items available is defined later in this document.
Many live data parameters have an associated status parameter which defines if the parameter is valid or in error. So for instance **Product Level** has an associated field called **Product Level Status**. The status will have the following values:

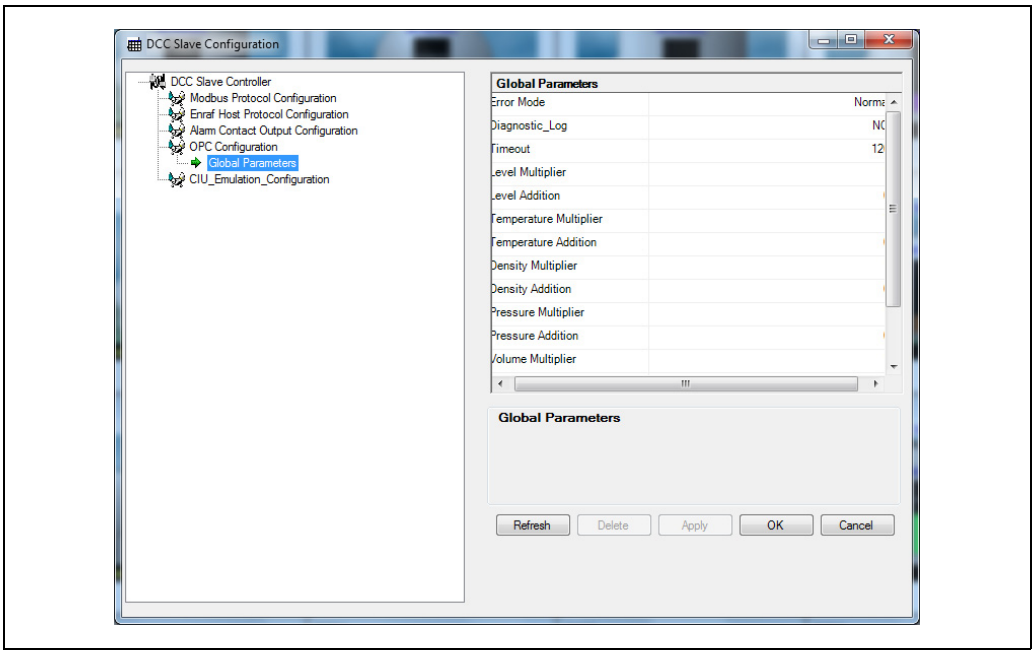
- -1 = parameter is valid
- 0 or above = parameter is invalid and the status is the DN code

Unless otherwise stated, all data items are **read only**, that is, they may only be read by the client.

9.5.2 Legacy Error Mode

In **Normal** mode when a parameter (level, temperature etc.) is invalid then this will be indicated by the associated status field (level status, temperature status etc.) being set to the error code (-1 = valid, 0+ = DN error code).
The actual parameter field will retain its last known value. The **OPC Quality** for the parameter and status fields will remain **Good** (see next section on OPC Properties, → 21).
There is a **Legacy** mode available which makes the **OPC quality** represent the validity of the actual data item values.
By default the error mode is **Normal**.

- **OPC Configuration → Global Parameters → Error Mode**



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9.5.3 Data Item Properties

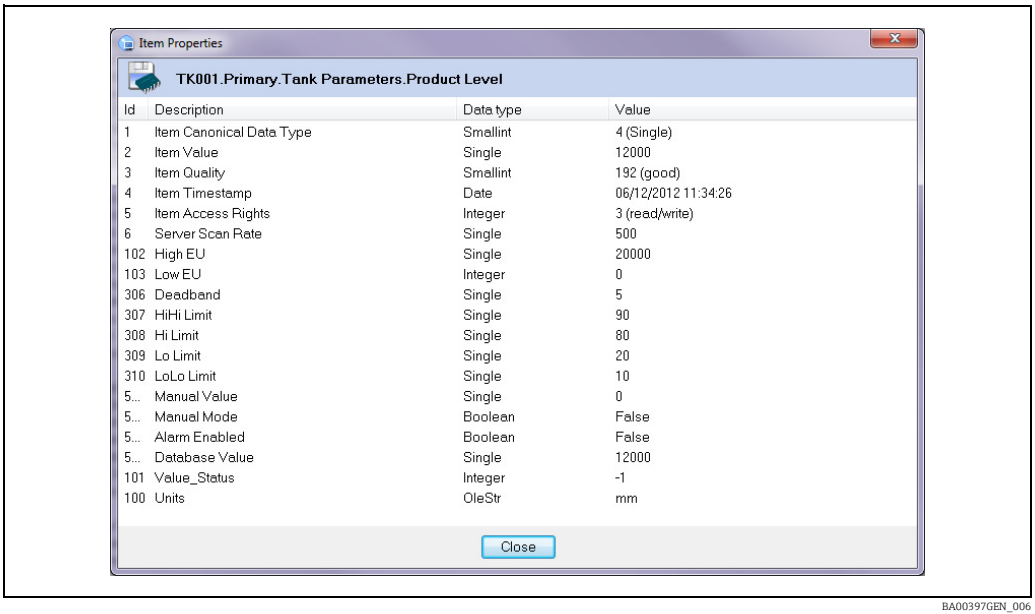
All Data Items will have an associated set of **OPC Data Properties**. These will always include the six standard **OPC Properties**:

- 1 Data Type
- 2 Value
- 3 Quality
- 4 Timestamp
- 5 Access Rights
- 6 Scan Rate

The standard Timestamp property is the time the data item was read from the **RTDB**, not the time of update from the gauge.

Unless otherwise stated, all data items have Access Rights of **READ ONLY**.

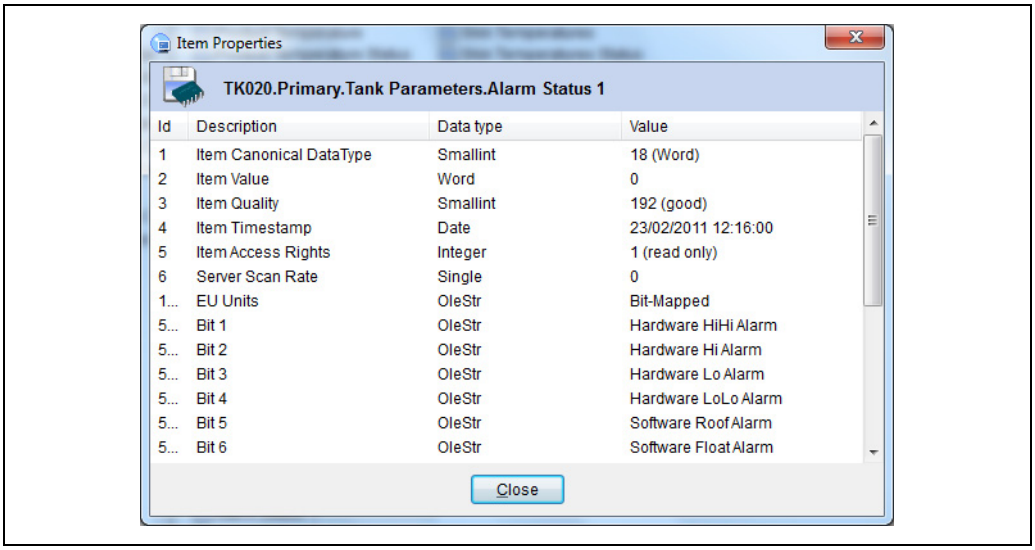
Many items will also have extra properties defining configuration data which only applies to that item. These generally define certain configuration data that is usually fixed or change very infrequently, such as alarm limits, units, manual values etc. Items with configurable units will have the unit descriptor and database value by default.



BA00397GEN_006

9.5.4 Bit-Mapped Data Items

Certain data items are available as bit-mapped integers; these include **Alarm Status**, **Gauge Mode** etc. Such items will have the property **Units** set to **Bit-Mapped**.
A further set of properties will then define the bit definitions.



BA00397GEN_007

The following bit-mapped items in the **Tank Parameters** block have also been made available split into separate Boolean data items and located in the **Status Bits** block:
- Alarm Status 1
- Alarm Status 2
- Servo Status
- Gauge Status
- System Status

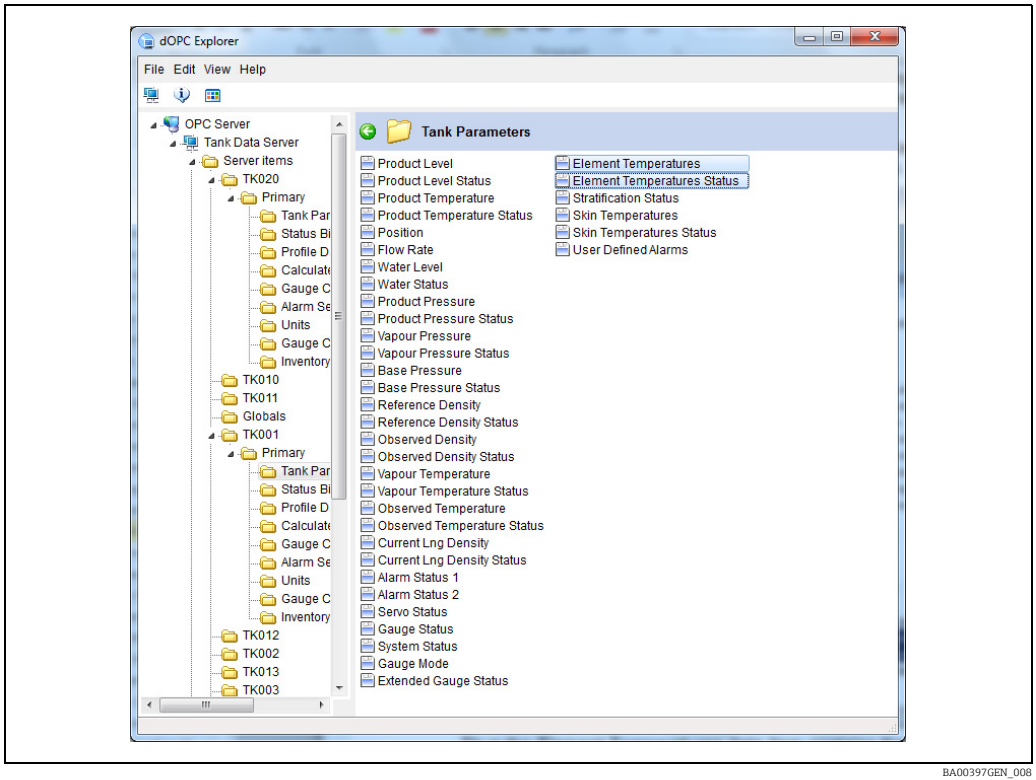
The most efficient way to access these items is through the bit-mapped field, however if the client does not support bit manipulations then the Boolean data items may be used instead. In addition to the standard bit-mapped status data there are a number of status fields that have no fixed mapping, but rather have a free form bit allocation dependent on the type of gauge being polled gauge. These codes include:

- GaugeMode
- ExtendedGaugeStatus

At present only the Scientific Instruments 6280/6290 and Whessoe ITG60/70 gauges have a set of bits defined, all others are blank.

9.5.5 Array Data Items

Certain data items are available as arrays of integers or floats. These include the **Element Temperatures** (in the **Tank Parameters** block) and all Profile items in the **Profiles** block. Each array item has 200 points. Array items are in pairs, one with the actual values and one with the corresponding statuses.

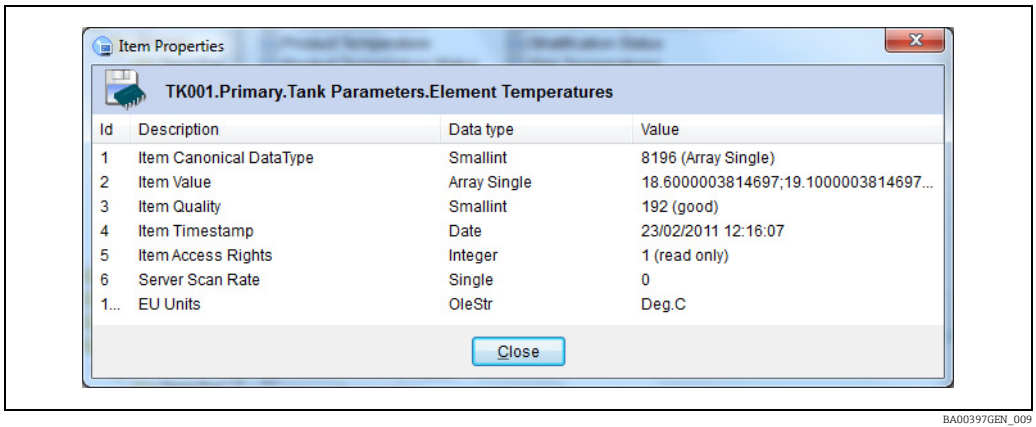


BA00397GEN_008

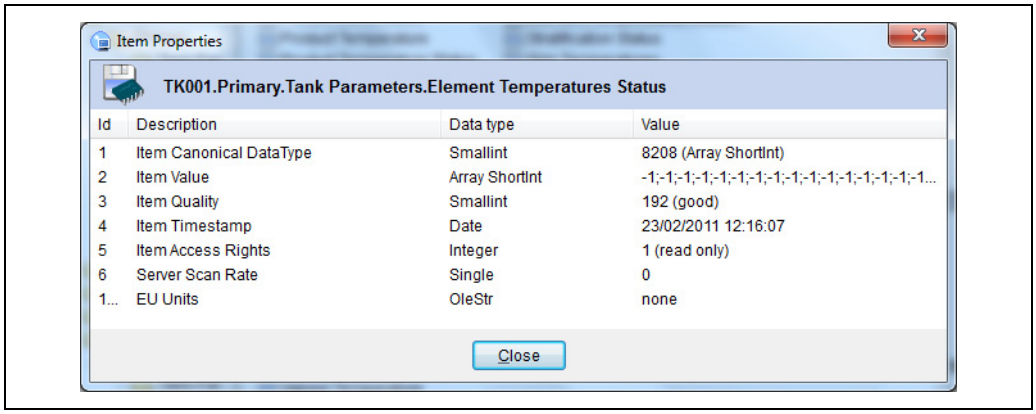
Thus the **Element Temperatures** data item contains the array of 200 actual data values (**Item Value**, see figure below) whilst the **Element Temperature Status** data item contains the array of 200 statuses (**Item Value**, see figure below) that correspond to the values. Statuses are mapped as −1 if the corresponding value is valid and zero or above if invalid, i.e. bad.

Only certain types of gauges support profiles.

The profile data items consist of the levels, temperatures and densities of the last profile carried out by the gauge. The **Time** item is the time that the profile was carried out.



BA00397GEN_009



BA00397GEN_010

9.5.6 Device Commands

The **Device Commands** section contains data items that may be written to by a client, and are used to issue commands to control a gauge.
The **Device Command** data field should be written to with a control code to activate a command. Simply enter the decimal value into the short-int.
The other items are a number of arguments that supply further information for the command being activated.

They **must** be written to **before** sending the control code to the **Device Command** item if required for the command.

The **Device Command** data item consists of an ASCII character which may be one of the following:

ASCII character	Description	Control code
A **B** **O** **X**	Alternate (Fast) Scan Basic (Normal) Scan Single Scan (for Off-Scan gauge) Exclude from Scan / Off-Scan	(decimal 65) (decimal 66) (decimal 79) (decimal 88)
T	Test Gauge (Servo Check)	(decimal 84)
C	Cancel Test	(decimal 67)
F	Freeze	(decimal 70)
N	Un-Freeze	(decimal 78)
S	Stow	(decimal 83)
U	Un-Stow	(decimal 85)
R	Raise	(decimal 82)

ASCII character	Description	Control code
L	Lower	(decimal 76)
Q	Calibrate	(decimal 81)
1	Interface 1 (air - product)	–
2	Interface 2 (tank bottom)	–
3	Interface 3 (product - water)	–
M	Store current Level, Temperature and Alarm Status	–
E **I** **K** **P**	Update Element Temperatures Update Tank/Interface Profile Levels Update Tank/Interface Profile Temperatures Update Tank/Interface Profile Densities	–
D **V** **W** **Y**	Dip mode (level/temperature dip) Profile Scan (temperature/density/water/datum, etc.) Water Dip Datum Dip (zero level)	–
Z	Initialise Gauge (Initialise Gauge Comms – does not reset the gauge itself)	–
- **(sp)**	Cancel current command No command active (status indication - not actually sent as a command)	–

If the device command is stow (S) then the following items may be used to set any options:

Stow Command: Type
- 0 = Stow Gauge to Top Limit Cut-out. = Lock Test to Level.
- 2 = Stow Gauge to Top Limit Cut-out then return to Product Level.
- 3 = Lock Test to Level then return to Product Level.

Stow Command: Lock Test Level
- 0 = Lock Test to Top Limit Cut-out, otherwise use level in mm.

If the device command is servo (T) then the following items may be used to set any options:

Stow Command: Test Distance
- 0 = use default 300 mm, otherwise use distance in mm.

Stow Command: Test Tolerance
- 0 = use default ± 5 mm, otherwise use tolerance +- mm.

Stow Command: Test Timeout
- 0 = use default 90 seconds, otherwise use timeout in seconds.

If the device command is profile (V) then the following items may be used to set any options:

Profile Command: Topscan
- 0 = Tank (Full) Profile.
- 1 = Interface Profile (Topscan).

Command: Scan Upwards
- 0 = Downwards Scan.
- 1 = Upwards Scan.

Command: Include Water
- 0 = Exclude Water Level Dip.
- 1 = Include Water Level Dip.

Command: Include Datum
- 0 = Exclude Datum Level Dip.
- 1 = Include Datum Level Dip.

Command: Exclude Temperature
- 0 = Include Temperature Profile Scan.
- 1 = Exclude Temperature Profile Scan.

Command: Exclude Density
- 0 = Include Density Profile Scan.
- 1 = Exclude Density Profile Scan.

Command: Positions are Relative
- 0 = Profile Scan Limit Levels Use Absolute Positions.
- 1 = Profile Scan Limit Levels Use Relative Positions.

Command: End Position
- 0 = use value pre-configured in gauge, otherwise use position in mm.

Command: Start Position
- 0 = use value pre-configured in gauge, otherwise use position in mm.

Command: Interval
- >=1 <=64 Number of Profile Points.
- >=65 Profile Interval (mm).
- 0 = use value pre-configured in gauge.

10 Data Items

10.1 Globals

There is always one fixed section in the namespace, called **Globals**.
This contains items which do not apply to an individual tank, but to the system as a whole.

Data items in this group are:

- **Watchdog** – This is an Integer value which increments whilst the system communications are valid. The actual value is not important; as long as it is incrementing then the data in the DCC subsystem is valid. If it stops incrementing then this indicates that there is a problem with the DCC sub-system, for instance the Olympus service may have stopped, and **all** tank data should be assumed to be invalid.
- **Connected Clients** – This is an integer value which contains a count of the total number of client systems that have connected to the server. This includes clients that are only browsing the OPC namespace, and those clients that have created OPC groups and are receiving live data from the server system.
- **Max Data Client** – This is an integer value which contains the licensed maximum number of clients that can be connected and requesting live data, at the same time. Clients that connect merely to browse the namespace (i.e. do not create **OPC Groups** for live data) are not restricted by the license.
- **Connected Data Clients** – This is an integer value which contains the number of clients that are connected and receiving live data from the server. It will never exceed the licensed maximum allowed, and when this figure is reached any new clients attempting to get live data from the server will be refused.
- **Gauge Count** – an integer value indicating the number of gauges currently configured in the system
- **Gauge No Reply Count** – an integer value indicating the number of gauges that have the **No Reply** status set in their **Extended Alarm Status** bits. The count goes across all communications interfaces in the system and includes only gauges which are being actively polled - gauges that are offline or set with both manual level and temperature are disregarded.
- **Legacy Mode Enabled** – a flag which affects the operation of the **OPC Quality** for each item. In the **OPC Standard** the **OPC Quality** of an item refers to the quality of the read operation to retrieve that item; it does not imply any quality for the actual value of the item. For example, it is possible to have a value for product level which is invalid because the gauge is in a no-reply state; in this case the **OPC Quality** would still be **Good** since the value would be read successfully. By setting this flag to true it is possible to force the **OPC Server** to imply **OPC Quality** for an item from its associated status value. So a product level status of 4 (which signifies an invalid product level) would force OPC quality for product level to be **Bad**.
- **Logging Level** – the level of diagnostic logging to record. The OPC server is capable of logging diagnostic information in 3 different modes.
  – **Error** – only error conditions are logged
  – **Information** – both error conditions and information messages are logged
  – **Verbose** – all messages (including data read messages) are logged
  The **Error** and **Information** log messages are written to a file named %ProgramData%\Tank Farm Automation\Common\Logs\OpcLog.log
  This file has a fixed size limit of 2 Mb.
  The Verbose log messages are written to a file named %ProgramData%\Tank Farm Automation\Common\Logs\OpcDataLog.log
  This file has a fixed size limit of 20 Mb.
- **Computer Name** – the hostname of the computer running the **OPC Server**.

10.1.1 Globals.ValueModifiers

Globals.ValueModifiers.< GlobalModifierDataItem >
The items in this branch show multiplier and addition modifiers which may be applied to values which support unit configuration to scale the value as required. By default these are set to **1** for the multiplier and **0** for the addition.
When a value that supports units is displayed it will first be converted to the specified unit, then multiplied by the multiplier value and finally have the addition value added before being displayed.
When writing a value, the reverse is applied.

Any manual writes to values using non-system units must be made in the same units and scaling the value is displayed in.

All items which support unit conversions also have a property called **Database Value** which represents the value actually stored in system units in the systems database.

10.2 System

- **Current redundancy Mode**
  Current redundancy mode of this server
- **DCC Start Time**
  Start time of the current running instance of the DCC communications service
- **Last Switch Port**
  Port that last caused a redundant switch
- **Last Switch Reason**
  Reason for the last redundant switch
- **Last Switch Time**
  Time of the last redundant switch
- **Redundancy Type**
  Configured redundancy type

10.3 Ports.<PortNumber>

- **Port Number**
  The port number
- **Slave**
  Shows if the port is a slave port
- **Active**
  Shows if the port is active or not
- **Protocol**
  The communications protocol in use on the port

10.3.1 Parameters

- **Number Of Devices**
  Number of devices connected to the port
- **Poll Count**
  Number of device polls
- **Valid Reply Count**
  Number of valid replies
- **Timeout Count**
  Number of timeouts
- **Invalid Reply Count**
  Number of invalid replies
- **Last Request Time**
  Time of last request
- **Last Response Time**
  Time of last response
- **Connection Status**
  Current connection status
- **Connected**
  Shows if the port is connected
- **Comms Valid**
  Shows if the port communications are valid
- **Tunneling**
  Shows if tunneling is enabled for the port
- **Connection Type**
  Port connection type
- **Max Retries**
  Maximum number of retries
- **Poll Delay Time**
  Delay between polls
- **Background Scan Period**
  Time period after which a background scan will be carried out
- **Comms Timeout**
  Time to wait before timeout is signalled

10.4 Tank.<Gauge Duty>.<Tank ID>

10.4.1 Tank Parameters

Certain of the parameters are bit-mapped, for further information on these, refer to the section on Bit-Mapped Data Items (→ 22).
Certain data items in this section have write access permissions, in addition to read permission. These are marked **(w)** in the **Type** column. They can only be written to if their corresponding manual mode setting is set to **TRUE**. See section on Gauge Configuration Items (→ 38) for details on manual mode items.

The complete list of data parameters is given in the following set of tables.

Name	Type	Properties
Product Level	VT_R4 (w)	▪ Units ▪ Prog. Deadband ▪ Prog. HiHi Limit ▪ Prog. Hi Limit ▪ Prog. Lo Limit ▪ Prog. LoLo Limit ▪ Prog. Alarm Enabled ▪ Manual Value ▪ Manual Mode Enabled

Name	Type	Properties
Product Level Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Product Temperature	VT_R4 (w)	▪ Units ▪ High Range ▪ Low Range ▪ Prog. Deadband ▪ Prog. Hi Limit ▪ Prog. Lo Limit ▪ Prog. Alarm Enabled ▪ Manual Value ▪ Manual Mode Enabled
Product Temperature Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Displacer Position	VT_R4	Units
Displacer Position Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Gauge Dip	VT_R4	Units
Flow Rate	VT_R4	Units
Average Flow Rate	VT_R4	Units
Water Level	VT_R4 (w)	▪ Units ▪ Prog. Deadband ▪ Prog. Hi Limit ▪ Prog. Lo Limit ▪ Prog. Alarm Enabled ▪ Manual Value ▪ Manual Mode Enabled
Water Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Product Pressure	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Product Pressure Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Vapour Pressure	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Vapour Pressure Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Base Pressure	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Base Pressure Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Air Pressure	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Air Pressure Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Reference Density	VT_R4 (w)	▪ Units ▪ Prog. Deadband ▪ Prog. Hi Limit ▪ Prog. Lo Limit ▪ Prog. Alarm Enabled ▪ Manual Value ▪ Manual Mode Enabled
Reference Density Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number

Name	Type	Properties
Gauge Density	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Gauge Density Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Observed Density	VT_R4 (w)	▪ Units ▪ Prog. Deadband ▪ Prog. Hi Limit ▪ Prog. Lo Limit ▪ Prog. Alarm Enabled ▪ Manual Value ▪ Manual Mode Enabled
Observed Density Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Vapour Temperature	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Vapour Temperature Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Observed Temperature	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Observed Temperature Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Current Lng Density	VT_R4	Units
Current Lng Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Alarm Status 1	VT_UI2 (Bit-mapped)	▪ Bit 1 = HiHi Alarm ▪ Bit 2 = Hi Alarm ▪ Bit 3 = Lo Alarm ▪ Bit 4 = LoLo Alarm ▪ Bit 5 = Software Roof Alarm ▪ Bit 6 = Software Float Alarm ▪ Bit 7 = Software Diff Alarm ▪ Bit 8 = Move Alarm ▪ Bit 9 = Software HiHi Alarm ▪ Bit 10 = Software Hi Alarm ▪ Bit 11 = Software Lo Alarm ▪ Bit 12 = Software LoLo Alarm ▪ Bit 13 = Soft Temp Hi Alarm ▪ Bit 14 = Soft Temp Lo Alarm ▪ Bit 15 = Soft Hi Flow Alarm ▪ Bit 16 = Soft Lo Flow Alarm
Alarm Status 2	VT_UI2 (Bit-mapped)	▪ Bit 1 = Lo Density Alarm ▪ Bit 2 = Hi Density Alarm ▪ Bit 3 = Lo Temp Alarm ▪ Bit 4 = Hi Temp Alarm ▪ Bit 5 = Soft Hi Density Alarm ▪ Bit 6 = Soft Lo Density Alarm ▪ Bit 7 = Soft Density Dev Alarm ▪ Bit 8 = Soft Temp Dev Alarm ▪ Bit 9 = Soft Hi Water Alarm ▪ Bit 10 = Soft Lo Water Alarm ▪ Bit 11 = Temp Dev Alarm ▪ Bit 12 = Density Dev Alarm ▪ Bit 13 = Not Used ▪ Bit 14 = Not Used ▪ Bit 15 = Not Used ▪ Bit 16 = Not Used

Name	Type	Properties
Alarm Status 3	VT_UI2 (Bit-mapped)	▪ Bit 1 = Software No Flow Alarm ▪ Bit 2 = Unauthorised Level Movement Alarm ▪ Bit 3 = Tank Mode Timer Alarm ▪ Bits 4 to 11 = Gauge Specific Alarm 1 to 8 ▪ Bits 12 to 19 = Prog User Defined Alarm 1 to 8 ▪ Bit 20= Skin Sensor Low Temp Alarm ▪ Bit 21= Skin Sensor High Temp Alarm ▪ Bit 22= Skin Sensor Hot Spot Alarm ▪ Bit 23= Skin Sensor Leak Alarm
Servo Status	VT_I1 (Bit-mapped)	▪ Bit 1 = Servo Up ▪ Bit 2 = Servo Down ▪ Bit 3 = Stowed/Top Stop ▪ Bit 4 = Bottom Stop ▪ Bit 5 = Off Level ▪ Bit 6 = Water mode ▪ Bit 7 = Testing ▪ Bit 8 = Frozen
Gauge Status	VT_I1 (Bit-mapped)	▪ Bit 1 Config Command Data Ready ▪ Bit 2 = Config Command Executing ▪ Bit 3 = Gauge Command Data Ready ▪ Bit 4 = Gauge Command Executing ▪ Bit 5 = Gauge Initialising ▪ Bit 6 = Fast Scan ▪ Bit 7 = Manual Scan Completed ▪ Bit 8 = Off Scan
EH Gauge Status	VT_UI2	
System Status	VT_I1 (Bit-mapped)	▪ Bit 1 = Test/Calibration Passed ▪ Bit 2 = Test/Calibration Failed ▪ Bit 3 = Config Command Failed ▪ Bit 4 = Gauge Command Failed ▪ Bit 5 = Gauge Fault ▪ Bit 6 = Data Available ▪ Bit 7 = Fault Data Available ▪ Bit 8 = General Fault
Gauge Mode	VT_I2 (Bit-mapped)	–
Extended Gauge Status	VT_UI2 (Bit-mapped)	–
Element Temperatures	Array of VT_R4 (Max 16)	Units
Element Temperatures Status	Array of VT_I1 (Max 16)	–
Stratification Status	VT_I1	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
User Defined Alarms	VT_I1	▪ Bit 1 = User Def. Alarm 1 ▪ Bit 2 = User Def. Alarm 2 ▪ Bit 3 = User Def. Alarm 3 ▪ Bit 4 = User Def. Alarm 4 ▪ Bit 5 = User Def. Alarm 5 ▪ Bit 6 = User Def. Alarm 6 ▪ Bit 7 = User Def. Alarm 7 ▪ Bit 8 = User Def. Alarm 8
Air Temperature	VT_R4 (w)	▪ Units ▪ Manual Value ▪ Manual Mode Enabled
Air Temperature Status	VT_I1	▪ -1 = Parameter valid ▪ 0+ = DN number
Oil Depth	VT_R4 (w)	Units

Name	Type	Properties
Skin Temperatures	Array of VT_R4 (Max 16)	Units
Skin Temperature Status	Array of VT_I1 (Max 16)	–

10.5 Status Bits

Name	Type	Properties
Blocked or Frozen	VT_BOOL	–
Bottom Limit	VT_BOOL	–
Config Command Data Ready	VT_BOOL	–
Config Command Executing	VT_BOOL	–
Config Command Failed	VT_BOOL	–
Data Available	VT_BOOL	–
Density Deviation Alarm	VT_BOOL	–
Fast Scan	VT_BOOL	–
Fault Data Available	VT_BOOL	–
Gauge Command Data Ready	VT_BOOL	–
Gauge Command Executing	VT_BOOL	–
Gauge Command Failed	VT_BOOL	–
Gauge Fault	VT_BOOL	–
Gauge Initialising	VT_BOOL	–
General Fault	VT_BOOL	–
Hardware Hi Alarm	VT_BOOL	–
Hardware HiHi Alarm	VT_BOOL	–
Hardware Lo Alarm	VT_BOOL	–
Hardware LoLo Alarm	VT_BOOL	–
Hi Density Alarm	VT_BOOL	–
Hi Temperature Alarm	VT_BOOL	–
Lo Density Alarm	VT_BOOL	–
Lo Temperature Alarm	VT_BOOL	–
Manual Scan Completed	VT_BOOL	–
No Reply From Gauge Alarm	VT_BOOL	–
Off Level	VT_BOOL	–
Offscan	VT_BOOL	–
Servoing Down	VT_BOOL	–
Servoing Up	VT_BOOL	–
Software Density Deviation Alarm	VT_BOOL	–
Software Difference Alarm	VT_BOOL	–
Software Variable Alarm	VT_BOOL	–
Software Hi Alarm	VT_BOOL	–
Software Hi Density Alarm	VT_BOOL	–
Software Hi Flow Alarm	VT_BOOL	–
Software Hi Temperature Alarm	VT_BOOL	–

Name	Type	Properties
Software Hi Water Alarm	VT_BOOL	–
Software HiHi Alarm	VT_BOOL	–
Software Lo Alarm	VT_BOOL	–
Software Lo Density Alarm	VT_BOOL	–
Software Lo Flow Alarm	VT_BOOL	–
Software Lo Temperature Alarm	VT_BOOL	–
Software Lo Water Alarm	VT_BOOL	–
Software LoLo Alarm	VT_BOOL	–
Software Roof Alarm	VT_BOOL	–
Software Temp Deviation Alarm	VT_BOOL	–
Stowed or Top Limit	VT_BOOL	–
Temp Deviation Alarm	VT_BOOL	–
Test or Calibration Failed	VT_BOOL	–
Test or Calibration Passed	VT_BOOL	–
Testing	VT_BOOL	–
Theft Alarm	VT_BOOL	–
Time To Variable Alarm	VT_BOOL	–
Unauthorised Movement Alarm	VT_BOOL	–
User Defined Alarms 1 to 8	VT_BOOL	8 tags
Water Interface Mode	VT_BOOL	–
Software No Flow Alarm	VT_BOOL	
Unauthorised Level Movement Alarm	VT_BOOL	
Gauge Specific Alarm 1 to 8	VT_BOOL	8 tags
Prog User Defined Alarm 1 to 8	VT_BOOL	8 tags
Skin Sensor Low Temp Alarm	VT_BOOL	
Skin Sensor High Temp Alarm	VT_BOOL	
Skin Sensor Hot Spot Alarm	VT_BOOL	
Skin Sensor Leak Alarm	VT_BOOL	

10.6 Profile Data

Most of the parameters in this section have an array format. Refer to the section on Array Data Items for further information on these.

Name	Type	Properties
Lower Density	VT_R4	Units
Lower Density Status	VT_I1	–
Lower Interface Level	VT_R4	Units
Lower Interface Level Status	VT_I1	–
Middle Density	VT_R4	Units
Middle Density Status	VT_I1	–
Middle Interface Level	VT_R4	Units
Middle Interface Level status	VT_I1	–

Name	Type	Properties
Number Profile Points	VT_I2	–
Profile Densities	Array of VT_R4 (max 256)	Units
Profile Densities Status	Array of VT_I1 (max 256)	–
Profile Levels	Array of VT_R4 (max 256)	–
Profile Levels Status	Array of VT_I1 (max 256)	–
Profile Temperatures	Array of VT_R4 (max 256)	Units
Profile Temperatures Status	Array of VT_I1 (max 256)	–
Profile Time	Text	–
Upper Density	VT_R4	Units
Upper Density Status	VT_I1	–
Upper Interface Level	VT_R4	Units
Upper Interface Level Status	VT_I1	–

10.7 Calculated Parameters

Name	Type	Properties
Calorific Value	VT_R8	–
Days to Density Equalisation (DDE)	VT_R4	Units
DDE Confidence	VT_I2	Units
DeadStock	VT_R8	Units
Difference Level	VT_R4	Units
Free Water Volume	VT_R8	Units
Gross Mass	VT_R8	Units
Gross Observed Volume	VT_R8	Units
Gross Standard Volume	VT_R8	Units
Gross Weight	VT_R8	Units
Level Extent	VT_R4	Units
Liquid Mass	VT_R8	Units
Liquid Weight	VT_R8	Units
Mass Flow Rate (tonnes)	VT_R4	Units
Max Operating Volume	VT_R8	Units
Min Operating Volume	VT_R8	Units
Net Mass	VT_R8	Units
Net Observed Volume	VT_R8	Units
Net Standard Volume	VT_R8	Units
Net Weight	VT_R8	Units
Reference Height	VT_R4	Units
Shell Capacity	VT_R8	Units
Standard Ullage Volume	VT_R8	Units
Standard Usable Volume	VT_R8	Units
Stratification Severity	VT_I1	Units
Time To Fill Empty	VT_R4	Units
Time to Stop Gauge	VT_R4	Units

Name	Type	Properties
Total Calculated Volume	VT_R8	Units
Total Gross Standard Volume	VT_R8	Units
Total Observed Volume	VT_R8	Units
Ullage Level	VT_R4	Units
Ullage Mass	VT_R8	Units
Ullage Volume	VT_R8	Units
Ullage Weight	VT_R8	Units
Usable Mass	VT_R8	Units
Usable Volume	VT_R8	Units
Usable Weight	VT_R8	Units
Vapour Mass	VT_R8	Units
Vapour Standard Volume	VT_R8	Units
Vapour Weight	VT_R8	Units
Volume Correction Factor	VT_R8	–
Volume Flow Rate (m3)	VT_R4	Units
Water Extent	VT_R4	Units
Product Depth	VT_R4	Units
Percentage Level	VT_R4	Units
Percentage Volume	VT_R4	Units
Weight Correction Factor	VT_R4	–
Gauged Volume	VT_R4	Units
Average Volume Flow Rate (m3)	VT_R4	Units
Average Volume Flow Rate (tonnes)	VT_R4	Units
Barrel Conversion Factor	VT_R4	Units
Standard Barrels	VT_R4	Units

10.8 Device Commands

All data items in this section have read/write access permissions - refer to the section on Device Commands for further information.

Name	Type	Properties
Device Command	VT_I1	–
Profile Command : End Position	VT_I4	Units
Profile Command : Exclude Density	VT_BOOL	–
Profile Command : Exclude Temp	VT_BOOL	–
Profile Command : Include Datum	VT_BOOL	–
Profile Command : Include Water	VT_BOOL	–
Profile Command : Interval	VT_UI4	Units
Profile Command : Positions are relative	VT_BOOL	–
Profile Command : Scan Upwards	VT_BOOL	–
Profile Command : Start Position	VT_I4	Units
Profile Command : TopScan	VT_BOOL	–
Servo Command : Test Distance	VT_UI4	Units

Name	Type	Properties
Servo Command : Test Timeout	VT_UI4	Units
Servo Command : Test Tolerance	VT_UI4	Units
Stow Command : Lock Test Level	VT_UI4	Units
Stow Command : Type	VT_UI4	–

10.9 Alarm Setpoints

The following parameters can be accessed in the **Alarm Setpoints** section, using the path:

- tank.gaugeduty.AlarmSetpoints.parameter

For example:

- TK001.Primary.AlarmSetpoints.LevelHiHi

Certain data items in this section have write access permissions, in addition to read permission. They are marked **(w)** in the Type column.

Name	Type	Properties
Density Hi	VT_R4 (w)	Units
Density Hysteresis	VT_R4 (w)	Units
Density Lo	VT_R4 (w)	Units
Density Profile Deviation	VT_R4 (w)	Units
Difference Allowable Tolerance	VT_R4 (w)	Units
Difference Hysteresis	VT_R4 (w)	Units
Variable Hysteresis	VT_R4 (w)	Units
Variable Level	VT_R4 (w)	Units
Flow Hysteresis	VT_R4 (w)	Units
Flow Sample Time	VT_R4	Units
Free Water Hi	VT_R4 (w)	Units
Free Water Hysteresis	VT_R4 (w)	Units
Free Water Lo	VT_R4 (w)	Units
Leak Start	VT_R8	Units
Leak Threshold	VT_R8 (w)	Units
Level Based Alarm Start	VT_R4 (w)	Units
Level Based Alarm Threshold	VT_R4 (w)	Units
Level Hi	VT_R4 (w)	Units
Level HiHi	VT_R4 (w)	Units
Level Hysteresis	VT_R4 (w)	Units
Level Lo	VT_R4 (w)	Units
Level LoLo	VT_R4 (w)	Units
MaxFlowRate1	VT_R4 (w)	Units
MaxFlowRate2	VT_R4 (w)	Units
MaxFlowRate3	VT_R4 (w)	Units
MaxFlowRate4	VT_R4 (w)	Units
MinFlowRate1	VT_R4 (w)	Units
MinFlowRate2	VT_R4 (w)	Units
MinFlowRate3	VT_R4 (w)	Units

Name	Type	Properties
MinFlowRate4	VT_R4 (w)	Units
Pre Alarm 1	VT_R4	Units
Pre Alarm 2	VT_R4	Units
Pre Alarm 3	VT_R4	Units
Pre Alarm 4	VT_R4	Units
Pre Alarm Hysteresis	VT_R4 (w)	Units
Roof Early Warning	VT_R4 (w)	Units
Roof Hysteresis	VT_R4 (w)	Units
Target Level	VT_R4	Units
Temperature Hi	VT_R4 (w)	Units
Temperature Hysteresis	VT_R4 (w)	Units
Temperature Lo	VT_R4 (w)	Units
Temperature Profile Deviation	VT_R4 (w)	Units
Falling Transition Lower Boundary	VT_R4 (w)	Units
Falling Transition Upper Boundary	VT_R4 (w)	Units
Rising Transition Lower Boundary	VT_R4 (w)	Units
Rising Transition Upper Boundary	VT_R4 (w)	Units
Programmable User Defined Alarm 1 to 8 Setpoint	VT_R4 (w)	Units
Programmable User Defined Alarm 1 to 8 Hysteresis	VT_R4 (w)	Units
Programmable User Defined Alarm 1 to 8 Type	VT_R4 (w)	Units
Theft Threshold	VT_R4 (w)	Units

10.10 Gauge Configuration Items

Certain data items in this section have write access permissions, in addition to read permission. They are marked with a **(w)** in the Type column.

Name	Type	Properties
Air Pressure Manual Mode	VT_BOOL (w)	–
Air Temperature Manual Mode	VT_BOOL (w)	–
Base Pressure Manual Mode	VT_BOOL	–
Density Alarm Enabled	VT_BOOL (w)	–
Device Configuration	Text	–
Difference Alarm Enabled	VT_BOOL (w)	–
Element Temperatures Enabled	VT_BOOL	–
Float Diameter	VT_R8 (w)	Units
Float Reference Density	VT_R8 (w)	Units
Float Weight	VT_R8 (w)	Units
Flow Alarm Enabled	VT_BOOL (w)	–
Free Water Alarm Enabled	VT_BOOL (w)	–
Free Water Manual Mode	VT_BOOL (w)	–
Free Water Volume Manual Mode	VT_BOOL (w)	–

Name	Type	Properties
Gauge ID	Text	–
Gauge Reference Temperature	VT_R8 (w)	Units
Gauge Temperature Coefficient	VT_R8 (w)	–
Gauge Type	Text	–
Is Simulated	VT_BOOL (w)	–
Leak Alarm Enabled	VT_BOOL (w)	–
Level Alarm Enabled	VT_BOOL (w))	–
Mode Flags 1	VT_UI4 Bit-Mapped	–
Mode Flags 2	VT_UI4 Bit-Mapped	–
Multi Gauge Mode	VT_BOOL	–
Observed Density Manual Mode	VT_BOOL (w)	–
Observed Temperature Manual Mode	VT_BOOL (w)	–
Offline Mode	VT_BOOL (w)	–
Oil Depth Manual Mode	VT_BOOL (w)	–
Pre Alarm Direction	VT_BOOL (w)	–
Pre Alarm Enabled 1 to 4	VT_BOOL (w)	4 tags
Product Level Manual Mode	VT_BOOL (w)	–
Product Name	Text	–
Product Pressure Manual Mode	VT_BOOL (w)	–
Product Temperature Manual Mode	VT_BOOL (w)	–
Profile Deviation Alarm Enabled	VT_BOOL (w)	–
Reference Density Manual Mode	VT_BOOL (w)	–
Roof Alarm Enabled	VT_BOOL (w)	–
Roof Legs Down	VT_BOOL (w)	–
Strap Table Entered	VT_BOOL	–
Stratification Status Manual Mode	VT_BOOL	–
Tag	Text	
Temperature Alarm Enabled	VT_BOOL (w)	Read/Write
Vapour Pressure Manual Mode	VT_BOOL (w)	–
Vapour Temperature Manual Mode	VT_BOOL (w)	–
Vapour Uses Product Temp	VT_BOOL	–
Variable Alarm Enabled	VT_BOOL (w)	–
Variable Direction	VT_BOOL (w)	–
Water Table Entered	VT_BOOL	–

Those items in the above list with **manual mode** in their name (i.e. Product Level Manual Mode) are used to configure the source for the corresponding tank parameters (i.e. Product Level).

Manual Mode Value	Tank Parameter Source
1 or TRUE	Tank Parameter uses the manually entered value
0 or FALSE	Tank Parameter uses value returned from gauge

Those items in the list with **alarm enabled** in their name denote a configuration flag, used to enable/disable alarms within the tank gauging system.

Alarm Enabled Value	Alarm Operation
1 or TRUE	Enabled
0 or FALSE	Disabled

10.11 Inventory Configuration Items

Certain data items in this section have write access permissions, in addition to read permission. They are marked **(w)** in the Type column.

Name	Type	Properties
Air Density	VT_R8	–
Calculation Method	VT_UI4	–
Calibration Density	VT_R8	Units
Chemical Concentration	VT_R8	–
Combustion Temperature	VT_UI4	–
Correction Volume	VT_R8	Units
Density Correction Factor	VT_R8	–
Enraf Polynomial A	VT_R8	–
Enraf Polynomial B	VT_R8	–
Enraf Polynomial C	VT_R8	–
Enraf Polynomial D	VT_R8	–
Enraf Polynomial E	VT_R8	–
Hybrid Level Hysteresis	VT_R8	Units
Hybrid Minimum Level	VT_R8	Units
Hybrid Minimum Pressure	VT_R8	Units
Inventory Control Bits	VT_UI8	Bit-Mapped
Jis Method Control	VT_UI4	Units
Liquid Volume Ratio	VT_R4	–
Manual VCF	VT_R8 (w)	–
Max Operating Level	VT_R4	–
Metering Temperature	VT_UI4	–
Min Operating Level	VT_R4	–
Molecular Mass	VT_R4	–
Movement Planned Volume	VT_R4	–
Movement Start Level	VT_R4	–
Percentage Control	VT_UI4	–
Product Reference Temperature	VT_R4	–
Roof Floating Legs Down	VT_R4	–
Roof Floating Legs Up	VT_R4	–
Roof Support Legs Down	VT_R4	–
Roof Support Legs Up	VT_R4	–
Roof Weight	VT_R4	–
Shell Insulation Factor	VT_R8	–

Name	Type	Properties
Shell Reference Temperature	VT_R8	–
Shell Temperature Coefficient	VT_R8	–
Suspended Water	VT_R4	–
Suspended Sediment	VT_R4	–
Tank Shape	VT_UI4	–
Temperature Correction Factor	VT_R8	–
Thermal Expansion Coefficient	VT_R8 (w)	–
Vapour Calculation Control	VT_UI4	–
Volume Correction Control	VT_UI4	–

11 Appendix

11.1 Default XML configuration

11.1.1 Listing: TagDefinitions.xml

```
<?xml version="1.0" encoding="utf-8"?>
<Tags>
  <TankId>
    <Duty>
      <Tank_Configuration_Items Name="Tank_Configuration_Items">
        <TagItem TagType="ProductStatus" DisplayName="Product Status" />
        <TagItem TagType="TankStatus"    DisplayName="Tank Status" />
        <TagItem TagType="TankMode"      DisplayName="Tank Mode" />
      </Tank_Configuration_Items>
      <Inventory_Configuration_Items Name="Inventory_Configuration_Items">
        <TagItem TagType="VolumeCorrectionControl"     DisplayName="Volume Correction Control" />
        <TagItem TagType="VapourCalculationControl"    DisplayName="Vapour Calculation Control" />
        <TagItem TagType="TankShape"                   DisplayName="Tank Shape" />
        <TagItem TagType="InventoryControl"            DisplayName="Inventory Control Bits" />
        <TagItem TagType="ShellInsulationFactor"       DisplayName="Shell Insulation Factor" />
        <TagItem TagType="ShellTemperatureCoefficient" DisplayName="Shell Temperature Coefficient" />
        <TagItem TagType="ShellReferenceTemperature"   DisplayName="Shell Reference Temperature"   Units="Deg.C"/>
        <TagItem TagType="RoofFloatingLegsDown"        DisplayName="Roof Floating Legs Down"       Units="mm"/>
        <TagItem TagType="RoofSupportLegsDown"         DisplayName="Roof Support Legs Down"        Units="mm"/>
        <TagItem TagType="RoofFloatingLegsUp"          DisplayName="Roof Floating Legs Up"         Units="mm"/>
        <TagItem TagType="RoofSupportLegsUp"           DisplayName="Roof Support Legs Up"          Units="mm"/>
        <TagItem TagType="RoofWeight"                  DisplayName="Roof Weight"                   Units="kg"/>
        <TagItem TagType="TemperatureCorrectionFactor" DisplayName="Temperature Correction Factor" />
        <TagItem TagType="DensityCorrectionFactor"     DisplayName="Density Correction Factor" />
        <TagItem TagType="ProductReferenceTemperature" DisplayName="Product Reference Temperature" Units="Deg.C"/>
        <TagItem TagType="LiquidVolumeRatio"           DisplayName="Liquid Volume Ratio" />
        <TagItem TagType="ThermalExpansionCoefficient" DisplayName="ThermalExpansionCoefficient" />
        <TagItem TagType="MolecularMass"               DisplayName="Molecular Mass" />
        <TagItem TagType="ManualVCF"                   DisplayName="Manual VCF" />
        <TagItem TagType="SuspendedSediment"           DisplayName="SuspendedSediment" />
        <TagItem TagType="SuspendedWater"              DisplayName="Suspended Water" />
        <TagItem TagType="AirDensity"                  DisplayName="Air Density"                   Units="kg/l"/>
        <TagItem TagType="StartLevel"                  DisplayName="Movement Start Level"          Units="mm"/>
        <TagItem TagType="PlannedVolume"               DisplayName="Movement Planned Volume"       Units="l"/>
        <TagItem TagType="MaxOperatingLevel"           DisplayName="Max Operating Level"           Units="mm"/>
        <TagItem TagType="MinOperatingLevel"           DisplayName="Min Operating Level"           Units="mm"/>
        <TagItem TagType="ChemicalConcentration"       DisplayName="Chemical Concentration" />
        <TagItem TagType="EnrafA"                      DisplayName="Enraf Polynomial A" />
        <TagItem TagType="EnrafB"                      DisplayName="Enraf Polynomial B" />
        <TagItem TagType="EnrafC"                      DisplayName="Enraf Polynomial C" />
        <TagItem TagType="EnrafD"                      DisplayName="Enraf Polynomial D" />
        <TagItem TagType="EnrafE"                      DisplayName="Enraf Polynomial E" />
        <TagItem TagType="CombTemp"                    DisplayName="Combustion Temperature"        Units="Deg.C"/>
        <TagItem TagType="MeterTemp"                   DisplayName="Metering Temperature"          Units="Deg.C"/>
        <TagItem TagType="MethodOfCalculation"         DisplayName="Calculation Method" />
        <TagItem TagType="JISMethodControl"            DisplayName="Jis Method Control" />
        <TagItem TagType="PercentageControl"           DisplayName="Percentage Control" />
        <TagItem TagType="CorrectionVolume"            DisplayName="Correction Volume"             Units="l"/>
        <TagItem TagType="CalibrationDensity"          DisplayName="Calibration Density"           Units="kg/l"/>
        <TagItem TagType="HybridMinLevel"              DisplayName="Hybrid Minimum Level"          Units="mm"/>
        <TagItem TagType="HybridLevelHysteresis"       DisplayName="Hybrid Level Hysteresis"       Units="mm"/>
        <TagItem TagType="HybridMinPressure"           DisplayName="Hybrid Minimum Pressure"       Units="bar_a"/>
      </Inventory_Configuration_Items>
      <Gauge_Configuration_Items TagType="Gauge_Configuration_Items">
        <TagItem TagType="GaugeID"                     DisplayName="Gauge ID" />
        <TagItem TagType="GaugeType"                   DisplayName="Gauge Type" />
        <TagItem TagType="ProductName"                 DisplayName="Product Name" />
        <TagItem TagType="ModeFlags"                   DisplayName="Mode Flags 1" />
        <TagItem TagType="ModeFlagsEx"                 DisplayName="Mode Flags 2" />
        <TagItem TagType="ProductLevelManualMode"      DisplayName="Product Level Manual Mode" />
        <TagItem TagType="FreeWaterManualMode"         DisplayName="Free Water Manual Mode" />
        <TagItem TagType="OilDepthManualMode"          DisplayName="Oil Depth Manual Mode" />
        <TagItem TagType="ProductPressureManualMode"   DisplayName="Product Pressure Manual Mode" />
        <TagItem TagType="VapourPressureManualMode"    DisplayName="Vapour Pressure Manual Mode" />
        <TagItem TagType="AirPressureManualMode"       DisplayName="Air Pressure Manual Mode" />
        <TagItem TagType="ProductTemperatureManualMode" DisplayName="Product Temperature Manual Mode" />
        <TagItem TagType="ObservedTemperatureManualMode" DisplayName="Observed Temperature Manual Mode" />
        <TagItem TagType="AirTemperatureManualMode"    DisplayName="Air Temperature Manual Mode" />
        <TagItem TagType="VapourTemperatureManualMode" DisplayName="Vapour Temperature Manual Mode" />
        <TagItem TagType="ReferenceDensityManualMode"  DisplayName="Reference Density Manual Mode" />
        <TagItem TagType="ObservedDensityManualMode"   DisplayName="Observed Density Manual Mode" />
        <TagItem TagType="StrapTableEntered"           DisplayName="Strap Table Entered" />
        <TagItem TagType="WaterTableEntered"           DisplayName="Water Table Entered" />
        <TagItem TagType="RoofLegsDown"                DisplayName="Roof Legs Down" />
```

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```
75        <TagItem TagType="TemperatureAlarmEnabled"          DisplayName="Temperature Alarm Enabled" />
76        <TagItem TagType="MultiGaugeMode"                   DisplayName="Multi Gauge Mode" />
77        <TagItem TagType="FlowAlarmEnabled"                 DisplayName="Flow Alarm Enabled" />
78        <TagItem TagType="DifferenceAlarmEnabled"           DisplayName="Difference Alarm Enabled" />
79        <TagItem TagType="LevelAlarmEnabled"                DisplayName="Level Alarm Enabled" />
80        <TagItem TagType="VariableAlarmEnabled"             DisplayName="Variable Alarm Enabled" />
81        <TagItem TagType="VariableDirection"                DisplayName="Variable Direction" />
82        <TagItem TagType="RoofAlarmEnabled"                 DisplayName="Roof Alarm Enabled" />
83        <TagItem TagType="PreAlarmEnabled1"                 DisplayName="Pre Alarm Enabled1" />
84        <TagItem TagType="PreAlarmEnabled2"                 DisplayName="Pre Alarm Enabled2" />
85        <TagItem TagType="PreAlarmEnabled3"                 DisplayName="Pre Alarm Enabled3" />
86        <TagItem TagType="PreAlarmEnabled4"                 DisplayName="Pre Alarm Enabled4" />
87        <TagItem TagType="PreAlarmDirection"                DisplayName="Pre Alarm Direction" />
88        <TagItem TagType="ElementTemperaturesEnabled"       DisplayName="Element Temperatures Enabled" />
89        <TagItem TagType="LeakAlarmEnabled"                 DisplayName="Leak Alarm Enabled" />
90        <TagItem TagType="OfflineMode"                      DisplayName="Offline Mode" />
91        <TagItem TagType="DensityAlarmEnabled"              DisplayName="Density Alarm Enabled" />
92        <TagItem TagType="ProfileDeviationAlarmEnabled"     DisplayName="Profile Deviation Alarm Enabled" />
93        <TagItem TagType="FreeWaterAlarmEnabled"            DisplayName="Free Water Alarm Enabled" />
94        <TagItem TagType="FreeWaterVolumeManualMode"        DisplayName="Free Water Volume Manual Mode" />
95        <TagItem TagType="VapourUsesProductTemp"            DisplayName="Vapour Uses Product Temp" />
96        <TagItem TagType="StratificationStatusManualMode"   DisplayName="Stratification Status Manual Mode" />
97        <TagItem TagType="BasePressureManualMode"           DisplayName="Base Pressure Manual Mode" />
98        <TagItem TagType="LevelBasedAlarmEnabled"           DisplayName="Level Based Alarm Enabled" />
99        <TagItem TagType="GaugeReferenceTemperature"        DisplayName="Gauge Reference Temperature" Units="Deg.C"/>
100       <TagItem TagType="GaugeTemperatureCoefficient"      DisplayName="Gauge Temperature Coefficient"/>
101       <TagItem TagType="FloatDiameter"                    DisplayName="Float Diameter" Units="mm"/>
102       <TagItem TagType="FloatWeight"                      DisplayName="Float Weight" Units="kg"/>
103       <TagItem TagType="FloatReferenceDensity"            DisplayName="Float ReferenceDensity" Units="kg/m3"/>
104       <TagItem TagType="Tag"                              DisplayName="Tag"/>
105       <TagItem TagType="DeviceConfiguration"              DisplayName="Device Configuration"/>
106       <TagItem TagType="IsSimulated"                      DisplayName="Is Simulated"/>
107     </Gauge_Configuration_Items>
108     <Alarm_Setpoints TagType="Alarm_Setpoints">
109       <TagItem TagType="LeakThreshold"                    DisplayName="Leak Threshold"                    Units="mm"/>
110       <TagItem TagType="LeakStart"                        DisplayName="Leak Start"                        Units="mm"/>
111       <TagItem TagType="LevelBasedAlarmStart"             DisplayName="Level Based Alarm Start"           Units="mm"/>
112       <TagItem TagType="LevelHiHi"                        DisplayName="Level HiHi"                        Units="mm"/>
113       <TagItem TagType="LevelHi"                          DisplayName="Level Hi"                          Units="mm"/>
114       <TagItem TagType="LevelLo"                          DisplayName="Level Lo"                          Units="mm"/>
115       <TagItem TagType="LevelLoLo"                        DisplayName="Level LoLo"                        Units="mm"/>
116       <TagItem TagType="LevelHysteresis"                  DisplayName="Level Hysteresis"                  Units="mm"/>
117       <TagItem TagType="VariableLevel"                    DisplayName="Variable Level"                    Units="mm"/>
118       <TagItem TagType="VariableHysteresis"               DisplayName="Variable Hysteresis"               Units="mm"/>
119       <TagItem TagType="TimeToVariableAlarm"              DisplayName="Time To Variable Alarm" />
120       <TagItem TagType="RoofEarlyWarning"                 DisplayName="Roof Early Warning"                Units="mm"/>
121       <TagItem TagType="RoofHysteresis"                   DisplayName="Roof Hysteresis"                   Units="mm"/>
122       <TagItem TagType="TemperatureHigh"                  DisplayName="Temperature High"                  Units="Deg.C"/>
123       <TagItem TagType="TemperatureLow"                   DisplayName="Temperature Low"                   Units="Deg.C"/>
124       <TagItem TagType="TemperatureHysteresis"            DisplayName="Temperature Hysteresis"            Units="Deg.C"/>
125       <TagItem TagType="MaxFlowRate1"                     DisplayName="Max Flow Rate 1"                   Units="l/min"/>
126       <TagItem TagType="MaxFlowRate2"                     DisplayName="Max Flow Rate 2"                   Units="l/min"/>
127       <TagItem TagType="MaxFlowRate3"                     DisplayName="Max Flow Rate 3"                   Units="l/min"/>
128       <TagItem TagType="MaxFlowRate4"                     DisplayName="Max Flow Rate 4"                   Units="l/min"/>
129       <TagItem TagType="MinFlowRate1"                     DisplayName="Min Flow Rate 1"                   Units="l/min"/>
130       <TagItem TagType="MinFlowRate2"                     DisplayName="Min Flow Rate 2"                   Units="l/min"/>
131       <TagItem TagType="MinFlowRate3"                     DisplayName="Min Flow Rate 3"                   Units="l/min"/>
132       <TagItem TagType="MinFlowRate4"                     DisplayName="Min Flow Rate 4"                   Units="l/min"/>
133       <TagItem TagType="FlowHysteresis"                   DisplayName="Flow Hysteresis"                   Units="l/min"/>
134       <TagItem TagType="RisingTransitionLowerBoundary"    DisplayName="Rising Transition Lower Boundary"  Units="mm"/>
135       <TagItem TagType="RisingTransitionUpperBoundary"    DisplayName="Rising Transition Upper Boundary"  Units="mm"/>
136       <TagItem TagType="FallingTransitionLowerBoundary"   DisplayName="Falling Transition Lower Boundary" Units="mm"/>
137       <TagItem TagType="FallingTransitionUpperBoundary"   DisplayName="Falling Transition Upper Boundary" Units="mm"/>
138       <TagItem TagType="DifferenceAllowableTollerance"    DisplayName="Difference Allowable Tolerance"    Units="mm"/>
139       <TagItem TagType="DifferenceHysteresis"             DisplayName="Difference Hysteresis"             Units="mm"/>
140       <TagItem TagType="TargetLevel"                      DisplayName="Target Level"                      Units="mm"/>
141       <TagItem TagType="PreAlarm1"                        DisplayName="Pre Alarm 1"                       Units="mm"/>
142       <TagItem TagType="PreAlarm2"                        DisplayName="Pre Alarm 2"                       Units="mm"/>
143       <TagItem TagType="PreAlarm3"                        DisplayName="Pre Alarm 3"                       Units="mm"/>
144       <TagItem TagType="PreAlarm4"                        DisplayName="Pre Alarm 4"                       Units="mm"/>
145       <TagItem TagType="PreAlarmHysteresis"               DisplayName="Pre Alarm Hysteresis"              Units="mm"/>
146       <TagItem TagType="FlowSampleTime"                   DisplayName="Flow Sample Time" />
147       <TagItem TagType="DensityHigh"                      DisplayName="Density High"                      Units="kg/l"/>
148       <TagItem TagType="DensityLow"                       DisplayName="Density Low"                       Units="kg/l"/>
149       <TagItem TagType="DensityHysteresis"                DisplayName="Density Hysteresis"                Units="kg/l"/>
150       <TagItem TagType="TemperatureProfileDeviation"      DisplayName="Temperature Profile Deviation"     Units="Deg.C"/>
151       <TagItem TagType="DensityProfileDeviation"          DisplayName="Density Profile Deviation"         Units="kg/l"/>
152       <TagItem TagType="FreeWaterHigh"                    DisplayName="Free Water High"                   Units="mm"/>
153       <TagItem TagType="FreeWaterLow"                     DisplayName="Free Water Low"                    Units="mm"/>
154       <TagItem TagType="FreeWaterHysteresis"              DisplayName="Free Water Hysteresis"             Units="mm"/>
155       <TagItem TagType="LevelBasedAlarmThreshold"         DisplayName="Level Based Alarm Threshold"       Units="mm"/>
156       <TagItem TagType="ProgUserDefinedAlarmSetpoint1"    DisplayName="Programmable User Defined Alarm 1 SetPoint" />
157       <TagItem TagType="ProgUserDefinedAlarmSetpoint2"    DisplayName="Programmable User Defined Alarm 2 SetPoint" />
158       <TagItem TagType="ProgUserDefinedAlarmSetpoint3"    DisplayName="Programmable User Defined Alarm 3 SetPoint" />
159       <TagItem TagType="ProgUserDefinedAlarmSetpoint4"    DisplayName="Programmable User Defined Alarm 4 SetPoint" />
160       <TagItem TagType="ProgUserDefinedAlarmSetpoint5"    DisplayName="Programmable User Defined Alarm 5 SetPoint" />
161       <TagItem TagType="ProgUserDefinedAlarmSetpoint6"    DisplayName="Programmable User Defined Alarm 6 SetPoint" />
162       <TagItem TagType="ProgUserDefinedAlarmSetpoint7"    DisplayName="Programmable User Defined Alarm 7 SetPoint" />
163       <TagItem TagType="ProgUserDefinedAlarmSetpoint8"    DisplayName="Programmable User Defined Alarm 8 SetPoint" />
164       <TagItem TagType="ProgUserDefinedAlarmHysteresis1"  DisplayName="Programmable User Defined Alarm 1 Hysteresis" />
165       <TagItem TagType="ProgUserDefinedAlarmHysteresis2"  DisplayName="Programmable User Defined Alarm 2 Hysteresis" />
166       <TagItem TagType="ProgUserDefinedAlarmHysteresis3"  DisplayName="Programmable User Defined Alarm 3 Hysteresis" />
167       <TagItem TagType="ProgUserDefinedAlarmHysteresis4"  DisplayName="Programmable User Defined Alarm 4 Hysteresis" />
168       <TagItem TagType="ProgUserDefinedAlarmHysteresis5"  DisplayName="Programmable User Defined Alarm 5 Hysteresis" />
169       <TagItem TagType="ProgUserDefinedAlarmHysteresis6"  DisplayName="Programmable User Defined Alarm 6 Hysteresis" />
170       <TagItem TagType="ProgUserDefinedAlarmHysteresis7"  DisplayName="Programmable User Defined Alarm 7 Hysteresis" />
171       <TagItem TagType="ProgUserDefinedAlarmHysteresis8"  DisplayName="Programmable User Defined Alarm 8 Hysteresis" />
```

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```
172         <TagItem TagType="ProgUserDefinedAlarmControlType1"        DisplayName="Programmable User Defined Alarm 1 Type" />
173         <TagItem TagType="ProgUserDefinedAlarmControlType2"        DisplayName="Programmable User Defined Alarm 2 Type" />
174         <TagItem TagType="ProgUserDefinedAlarmControlType3"        DisplayName="Programmable User Defined Alarm 3 Type" />
175         <TagItem TagType="ProgUserDefinedAlarmControlType4"        DisplayName="Programmable User Defined Alarm 4 Type" />
176         <TagItem TagType="ProgUserDefinedAlarmControlType5"        DisplayName="Programmable User Defined Alarm 5 Type" />
177         <TagItem TagType="ProgUserDefinedAlarmControlType6"        DisplayName="Programmable User Defined Alarm 6 Type" />
178         <TagItem TagType="ProgUserDefinedAlarmControlType7"        DisplayName="Programmable User Defined Alarm 7 Type" />
179         <TagItem TagType="ProgUserDefinedAlarmControlType8"        DisplayName="Programmable User Defined Alarm 8 Type" />
180         <TagItem TagType="TheftThreshold"                          DisplayName="Theft Threshold" Units="mm"/>
181       </Alarm_Setpoints>
182       <Device_Commands TagType="Device_Commands">
183         <TagItem TagType="DeviceCommand"                    DisplayName="Device Command" />
184         <TagItem TagType="StowCommandType"                  DisplayName="Stow Command : Type" />
185         <TagItem TagType="StowCommandLockTestLevel"         DisplayName="Stow Command : Lock Test Level" />
186         <TagItem TagType="ServoCommandTestDistance"         DisplayName="Servo Command : Test Distance" />
187         <TagItem TagType="ServoCommandTestTolerance"        DisplayName="Servo Command : Test Tolerance" />
188         <TagItem TagType="ServoCommandTestTimeout"          DisplayName="Servo Command : Test Timeout" />
189         <TagItem TagType="ProfileCommandTopScan"            DisplayName="Profile Command : TopScan" />
190         <TagItem TagType="ProfileCommandScanUpwards"        DisplayName="Profile Command : Scan Upwards" />
191         <TagItem TagType="ProfileCommandIncludeWater"       DisplayName="Profile Command : Include Water" />
192         <TagItem TagType="ProfileCommandIncludeDatum"       DisplayName="Profile Command : Include Datum" />
193         <TagItem TagType="ProfileCommandExcludeTemperature" DisplayName="Profile Command : Exclude Temperature" />
194         <TagItem TagType="ProfileCommandExcludeDensity"     DisplayName="Profile Command : Exclude Density" />
195         <TagItem TagType="ProfileCommandPositionsareRelative" DisplayName="Profile Command : DisplacerPositions are Relative" />
196         <TagItem TagType="ProfileCommandEndPosition"        DisplayName="Profile Command : End DisplacerPosition" />
197         <TagItem TagType="ProfileCommandStartPosition"      DisplayName="Profile Command : Start DisplacerPosition" />
198         <TagItem TagType="ProfileCommandInterval"           DisplayName="Profile Command : Interval" />
199       </Device_Commands>
200       <Calculated_Parameters TagType="Calculated_Parameters">
201         <TagItem TagType="ProductDepth"                 DisplayName="Product Depth"                  Units="mm"/>
202         <TagItem TagType="PercentageLevel"              DisplayName="Percentage Level"/>
203         <TagItem TagType="PercentageVolume"             DisplayName="Percentage Volume"/>
204         <TagItem TagType="UllageLevel"                  DisplayName="Ullage Level"                   Units="mm"/>
205         <TagItem TagType="DifferenceLevel"              DisplayName="Difference Level"               Units="mm"/>
206         <TagItem TagType="LevelExtent"                  DisplayName="Level Extent"                   Units="mm"/>
207         <TagItem TagType="ReferenceHeight"              DisplayName="Reference Height"               Units="mm"/>
208         <TagItem TagType="WaterExtent"                  DisplayName="Water Extent"                   Units="mm"/>
209         <TagItem TagType="VolumeCorrectionFactor"       DisplayName="Volume Correction Factor" />
210         <TagItem TagType="WeightCorrectionFactor"       DisplayName="Weight Correction Factor" />
211         <TagItem TagType="GaugedVolume"                 DisplayName="Gauged Volume"                  Units="l"/>
212         <TagItem TagType="TotalObservedVolume"          DisplayName="Total Observed Volume"          Units="l"/>
213         <TagItem TagType="DeadStock"                    DisplayName="DeadStock"                      Units="l"/>
214         <TagItem TagType="FreeWaterVolume"              DisplayName="Free Water Volume"              Units="l"/>
215         <TagItem TagType="GrossObservedVolume"          DisplayName="Gross Observed Volume"          Units="l"/>
216         <TagItem TagType="NetObservedVolume"            DisplayName="Net Observed Volume"            Units="l"/>
217         <TagItem TagType="UsableVolume"                 DisplayName="Usable Volume"                  Units="l"/>
218         <TagItem TagType="UllageVolume"                 DisplayName="Ullage Volume"                  Units="l"/>
219         <TagItem TagType="GrossStandardVolume"          DisplayName="Gross Standard Volume"          Units="l"/>
220         <TagItem TagType="NetStandardVolume"            DisplayName="Net Standard Volume"            Units="l"/>
221         <TagItem TagType="StandardUsableVolume"         DisplayName="Standard Usable Volume"         Units="l"/>
222         <TagItem TagType="StandardUllageVolume"         DisplayName="Standard Ullage Volume"         Units="l"/>
223         <TagItem TagType="TotalGrossStandardVolume"     DisplayName="Total Gross Standard Volume"    Units="l"/>
224         <TagItem TagType="TotalCalculatedVolume"        DisplayName="Total Calculated Volume"        Units="l"/>
225         <TagItem TagType="GrossMass"                    DisplayName="Gross Mass"                     Units="kg"/>
226         <TagItem TagType="NetMass"                      DisplayName="Net Mass"                       Units="kg"/>
227         <TagItem TagType="UsableMass"                   DisplayName="Usable Mass"                    Units="kg"/>
228         <TagItem TagType="UllageMass"                   DisplayName="Ullage Mass"                    Units="kg"/>
229         <TagItem TagType="GrossWeight"                  DisplayName="Gross Weight"                   Units="kg"/>
230         <TagItem TagType="NetWeight"                    DisplayName="Net Weight"                     Units="kg"/>
231         <TagItem TagType="UsableWeight"                 DisplayName="Usable Weight"                  Units="kg"/>
232         <TagItem TagType="UllageWeight"                 DisplayName="Ullage Weight"                  Units="kg"/>
233         <TagItem TagType="ShellCapacity"                DisplayName="Shell Capacity"                 Units="l"/>
234         <TagItem TagType="MinOperatingVolume"           DisplayName="Min Operating Volume"           Units="l"/>
235         <TagItem TagType="MaxOperatingVolume"           DisplayName="Max Operating Volume"           Units="l"/>
236         <TagItem TagType="VapourStandardVolume"         DisplayName="Vapour Standard Volume"         Units="l"/>
237         <TagItem TagType="VapourMass"                   DisplayName="Vapour Mass"                    Units="kg"/>
238         <TagItem TagType="m3hFlowRate"                  DisplayName="Volume Flow Rate (m3)"          Units="m3/hr"/>
239         <TagItem TagType="m3hFlowRateAverage"           DisplayName="Average Volume Flow Rate (m3)"  Units="m3/hr"/>
240         <TagItem TagType="thFlowRate"                   DisplayName="Volume Flow Rate (tonnes)"      Units="T/hr"/>
241         <TagItem TagType="thFlowRateAverage"            DisplayName="Average Volume Flow Rate (tonnes)" Units="T/hr"/>
242         <TagItem TagType="VapourWeight"                 DisplayName="Vapour Weight"                  Units="kg"/>
243         <TagItem TagType="LiquidMass"                   DisplayName="Liquid Mass"                    Units="kg"/>
244         <TagItem TagType="LiquidWeight"                 DisplayName="Liquid Weight"                  Units="kg"/>
245         <TagItem TagType="StratificationSeverity"       DisplayName="Stratification Severity" />
246         <TagItem TagType="DDE"                          DisplayName="Days to Density Equalisation (DDE)" />
247         <TagItem TagType="DDEConfidence"                DisplayName="DDE Confidence" />
248         <TagItem TagType="CalorificValue"               DisplayName="Calorific Value" />
249         <TagItem TagType="LeakTestVolume"               DisplayName="Leak Test Volume"               Units="l"/>
250         <TagItem TagType="TimeToStopGauge"              DisplayName="Time to Stop Gauge" />
251         <TagItem TagType="TimeToFillEmpty"              DisplayName="Time to FillEmpty" />
252         <TagItem TagType="BBLConversionFactor"          DisplayName="Barrel Conversion Factor" />
253         <TagItem TagType="StandardBarrels"              DisplayName="Standard Barrels" />
254       </Calculated_Parameters>
255       <Profile_Data TagType="Profile_Data">
256         <TagItem TagType="NumberProfilePoints"      DisplayName="Number Profile Points" />
257         <TagItem TagType="ProfileLevels"            DisplayName="Profile Levels"          Units="mm"/>
258         <TagItem TagType="ProfileLevelsStatus"      DisplayName="Profile Levels Status" />
259         <TagItem TagType="ProfileTemperatures"      DisplayName="Profile Temperatures"    Units="Deg.C"/>
260         <TagItem TagType="ProfileTemperaturesStatus" DisplayName="Profile Temperatures Status" />
261         <TagItem TagType="ProfileDensities"         DisplayName="Profile Densities"       Units="kg/l"/>
262         <TagItem TagType="ProfileDensitiesStatus"   DisplayName="Profile Densities Status" />
263         <TagItem TagType="ProfileTime"              DisplayName="Profile Time" />
264         <TagItem TagType="UpperDensity"             DisplayName="Upper Density"           Units="kg/l"/>
265         <TagItem TagType="UpperDensityStatus"       DisplayName="Upper Density Status" />
266         <TagItem TagType="MiddleDensity"            DisplayName="Middle Density"          Units="kg/l"/>
267         <TagItem TagType="MiddleDensityStatus"      DisplayName="Middle Density Status" />
268         <TagItem TagType="LowerDensity"             DisplayName="Lower Density"           Units="kg/l"/>
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269         <TagItem TagType="LowerDensityStatus"          DisplayName="Lower Density Status" />
270         <TagItem TagType="UpperInterfaceLevel"         DisplayName="Upper Interface Level"  Units="mm"/>
271         <TagItem TagType="UpperInterfaceLevelStatus"   DisplayName="Upper Interface Level Status" />
272         <TagItem TagType="MiddleInterfaceLevel"        DisplayName="Middle Interface Level" Units="mm"/>
273         <TagItem TagType="MiddleInterfaceLevelStatus"  DisplayName="Middle Interface Level Status" />
274         <TagItem TagType="LowerInterfaceLevel"         DisplayName="Lower Interface Level"  Units="mm"/>
275         <TagItem TagType="LowerInterfaceLevelStatus"   DisplayName="Lower Interface Level Status" />
276       </Profile_Data>
277       <Status_Bits TagType="Status_Bits">
278         <TagItem TagType="HardwareHiHiAlarm"              DisplayName="Hardware HiHi Alarm" />
279         <TagItem TagType="HardwareHiAlarm"                DisplayName="Hardware Hi Alarm" />
280         <TagItem TagType="HardwareLoAlarm"                DisplayName="Hardware Lo Alarm" />
281         <TagItem TagType="HardwareLoLoAlarm"              DisplayName="Hardware LoLo Alarm" />
282         <TagItem TagType="SoftwareRoofAlarm"              DisplayName="Software Roof Alarm" />
283         <TagItem TagType="SoftwareVariableAlarm"          DisplayName="Software Variable Alarm" />
284         <TagItem TagType="SoftwareDifferenceAlarm"        DisplayName="Software Difference Alarm" />
285         <TagItem TagType="UnauthorisedMovementAlarm"      DisplayName="Unauthorised Movement Alarm" />
286         <TagItem TagType="SoftwareHiHiAlarm"              DisplayName="Software HiHi Alarm" />
287         <TagItem TagType="SoftwareHiAlarm"                DisplayName="Software Hi Alarm" />
288         <TagItem TagType="SoftwareLoAlarm"                DisplayName="Software Lo Alarm" />
289         <TagItem TagType="SoftwareLoLoAlarm"              DisplayName="Software LoLo Alarm" />
290         <TagItem TagType="SoftwareHiTemperatureAlarm"     DisplayName="Software Hi Temperature Alarm" />
291         <TagItem TagType="SoftwareLoTemperatureAlarm"     DisplayName="Software Lo Temperature Alarm" />
292         <TagItem TagType="SoftwareHiFLowAlarm"            DisplayName="Software Hi FLow Alarm" />
293         <TagItem TagType="SoftwareLoFlowAlarm"            DisplayName="Software Lo Flow Alarm" />
294         <TagItem TagType="LoDensityAlarm"                 DisplayName="Lo Density Alarm" />
295         <TagItem TagType="HiDensityAlarm"                 DisplayName="Hi Density Alarm" />
296         <TagItem TagType="LoTemperatureAlarm"             DisplayName="Lo Temperature Alarm" />
297         <TagItem TagType="HiTemperatureAlarm"             DisplayName="Hi Temperature Alarm" />
298         <TagItem TagType="SoftwareLoDensityAlarm"         DisplayName="Software Lo Density Alarm" />
299         <TagItem TagType="SoftwareHiDensityAlarm"         DisplayName="Software Hi Density Alarm" />
300         <TagItem TagType="SoftwareDensityDeviationAlarm"  DisplayName="Software Density Deviation Alarm" />
301         <TagItem TagType="SoftwareTempDeviationAlarm"     DisplayName="Software Temp Deviation Alarm" />
302         <TagItem TagType="SoftwareHiWaterAlarm"           DisplayName="Software Hi Water Alarm" />
303         <TagItem TagType="SoftwareLoWaterAlarm"           DisplayName="Software Lo Water Alarm" />
304         <TagItem TagType="DensityDeviationAlarm"          DisplayName="Density Deviation Alarm" />
305         <TagItem TagType="TempDeviationAlarm"             DisplayName="Temp Deviation Alarm" />
306         <TagItem TagType="TimeToVariableAlarmActive"      DisplayName="Time To Variable Alarm" />
307         <TagItem TagType="NoReplyFromGaugeAlarm"          DisplayName="No Reply From Gauge Alarm" />
308         <TagItem TagType="ServoingUp"                     DisplayName="Servoing Up" />
309         <TagItem TagType="ServoingDown"                   DisplayName="Servoing Down" />
310         <TagItem TagType="StowedorTopLimit"               DisplayName="Stowed or Top Limit" />
311         <TagItem TagType="BottomLimit"                    DisplayName="Bottom Limit" />
312         <TagItem TagType="OffLevel"                       DisplayName="Off Level" />
313         <TagItem TagType="WaterInterfaceMode"             DisplayName="Water Interface Mode" />
314         <TagItem TagType="Testing"                        DisplayName="Testing" />
315         <TagItem TagType="BlockedorFrozen"                DisplayName="Blocked or Frozen" />
316         <TagItem TagType="ConfigCommandDataReady"         DisplayName="Config Command Data Ready" />
317         <TagItem TagType="ConfigCommandExecuting"         DisplayName="Config Command Executing" />
318         <TagItem TagType="GaugeCommandDataReady"          DisplayName="Gauge Command Data Ready" />
319         <TagItem TagType="GaugeCommandExecuting"          DisplayName="Gauge Command Executing" />
320         <TagItem TagType="GaugeInitialising"              DisplayName="Gauge Initialising" />
321         <TagItem TagType="FastScan"                       DisplayName="Fast Scan" />
322         <TagItem TagType="ManualScanCompleted"            DisplayName="Manual Scan Completed" />
323         <TagItem TagType="OffScan"                        DisplayName="Off Scan" />
324         <TagItem TagType="TestorCalibrationPassed"        DisplayName="Test or Calibration Passed" />
325         <TagItem TagType="TestorCalibrationFailed"        DisplayName="Test or Calibration Failed" />
326         <TagItem TagType="ConfigCommandFailed"            DisplayName="Config Command Failed" />
327         <TagItem TagType="GaugeCommandFailed"             DisplayName="Gauge Command Failed" />
328         <TagItem TagType="GaugeFault"                     DisplayName="Gauge Fault" />
329         <TagItem TagType="DataAvailable"                  DisplayName="Data Available" />
330         <TagItem TagType="FaultDataAvailable"             DisplayName="Fault Data Available" />
331         <TagItem TagType="GeneralFault"                   DisplayName="General Fault" />
332         <TagItem TagType="UserDefinedAlarm1"              DisplayName="User Defined Alarm 1" />
333         <TagItem TagType="UserDefinedAlarm2"              DisplayName="User Defined Alarm 2" />
334         <TagItem TagType="UserDefinedAlarm3"              DisplayName="User Defined Alarm 3" />
335         <TagItem TagType="UserDefinedAlarm4"              DisplayName="User Defined Alarm 4" />
336         <TagItem TagType="UserDefinedAlarm5"              DisplayName="User Defined Alarm 5" />
337         <TagItem TagType="UserDefinedAlarm6"              DisplayName="User Defined Alarm 6" />
338         <TagItem TagType="UserDefinedAlarm7"              DisplayName="User Defined Alarm 7" />
339         <TagItem TagType="UserDefinedAlarm8"              DisplayName="User Defined Alarm 8" />
340         <TagItem TagType="TheftAlarm"                     DisplayName="Theft Alarm" />
341         <TagItem TagType="SoftwareNoFlowAlarm"            DisplayName="Software No Flow Alarm" />
342         <TagItem TagType="UnauthorisedLevelMovementAlarm" DisplayName="Unauthorised Level Movement Alarm" />
343         <TagItem TagType="GaugeSpecificAlarm1"            DisplayName="Gauge Specific Alarm 1" />
344         <TagItem TagType="GaugeSpecificAlarm2"            DisplayName="Gauge Specific Alarm 2" />
345         <TagItem TagType="GaugeSpecificAlarm3"            DisplayName="Gauge Specific Alarm 3" />
346         <TagItem TagType="GaugeSpecificAlarm4"            DisplayName="Gauge Specific Alarm 4" />
347         <TagItem TagType="GaugeSpecificAlarm5"            DisplayName="Gauge Specific Alarm 5" />
348         <TagItem TagType="GaugeSpecificAlarm6"            DisplayName="Gauge Specific Alarm 6" />
349         <TagItem TagType="GaugeSpecificAlarm7"            DisplayName="Gauge Specific Alarm 7" />
350         <TagItem TagType="GaugeSpecificAlarm8"            DisplayName="Gauge Specific Alarm 8" />
351         <TagItem TagType="ProgUserDefinedAlarm1"          DisplayName="Prog User Defined Alarm 1" />
352         <TagItem TagType="ProgUserDefinedAlarm2"          DisplayName="Prog User Defined Alarm 2" />
353         <TagItem TagType="ProgUserDefinedAlarm3"          DisplayName="Prog User Defined Alarm 3" />
354         <TagItem TagType="ProgUserDefinedAlarm4"          DisplayName="Prog User Defined Alarm 4" />
355         <TagItem TagType="ProgUserDefinedAlarm5"          DisplayName="Prog User Defined Alarm 5" />
356         <TagItem TagType="ProgUserDefinedAlarm6"          DisplayName="Prog User Defined Alarm 6" />
357         <TagItem TagType="ProgUserDefinedAlarm7"          DisplayName="Prog User Defined Alarm 7" />
358         <TagItem TagType="ProgUserDefinedAlarm8"          DisplayName="Prog User Defined Alarm 8" />
359         <TagItem TagType="SkinSensorLowTempAlarm"         DisplayName="Skin Sensor Low Temp Alarm" />
360         <TagItem TagType="SkinSensorHighTempAlarm"        DisplayName="Skin Sensor High Temp Alarm" />
361         <TagItem TagType="SkinSensorHotSpotAlarm"         DisplayName="Skin Sensor Hot Spot Alarm" />
362         <TagItem TagType="SkinSensorLeakAlarm"            DisplayName="Skin Sensor Leak Alarm" />
363       </Status_Bits>
364       <Tank_Parameters TagType="Tank_Parameters">
365         <TagItem TagType="GaugeDip"                 DisplayName="Gauge Dip"                 Units="mm"/>
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366         <TagItem TagType="GaugeDensity"                DisplayName="Gauge Density"             Units="kg/l"/>
367         <TagItem TagType="GaugeDensityStatus"          DisplayName="Gauge Density Status" />
368         <TagItem TagType="ProductLevel"                DisplayName="Product Level"             Units="mm"/>
369         <TagItem TagType="ProductLevelStatus"          DisplayName="Product Level Status" />
370         <TagItem TagType="ProductTemperature"          DisplayName="Product Temperature"       Units="Deg.C"/>
371         <TagItem TagType="ProductTemperatureStatus"    DisplayName="Product Temperature Status" />
372         <TagItem TagType="OilDepth"                    DisplayName="Oil Depth"                 Units="mm"/>
373         <TagItem TagType="DisplacerPosition"           DisplayName="Displacer Position"                Units="mm"/>
374         <TagItem TagType="DisplacerPositionStatus"     DisplayName="Displacer Position Status" />
375         <TagItem TagType="ProductLevelFlowRate"        DisplayName="Flow Rate"                 Units="mm/min"/>
376         <TagItem TagType="ProductLevelFlowRateAverage" DisplayName="Average Flow Rate"          Units="mm/min"/>
377         <TagItem TagType="WaterLevel"                  DisplayName="Water Level"               Units="mm"/>
378         <TagItem TagType="WaterStatus"                 DisplayName="Water Status" />
379         <TagItem TagType="ProductPressure"             DisplayName="Product Pressure"          Units="bar_a"/>
380         <TagItem TagType="ProductPressureStatus"       DisplayName="Product Pressure Status" />
381         <TagItem TagType="VapourPressure"              DisplayName="Vapour Pressure"           Units="bar_a"/>
382         <TagItem TagType="VapourPressureStatus"        DisplayName="Vapour Pressure Status" />
383         <TagItem TagType="AirPressure"                 DisplayName="Air Pressure"              Units="bar_a"/>
384         <TagItem TagType="AirPressureStatus"           DisplayName="Air Pressure Status" />
385         <TagItem TagType="BasePressure"                DisplayName="Base Pressure"             Units="bar_a"/>
386         <TagItem TagType="BasePressureStatus"          DisplayName="Base Pressure Status" />
387         <TagItem TagType="ReferenceDensity"            DisplayName="Reference Density"         Units="kg/l"/>
388         <TagItem TagType="ReferenceDensityStatus"      DisplayName="Reference Density Status" />
389         <TagItem TagType="ObservedDensity"             DisplayName="Observed Density"          Units="kg/l"/>
390         <TagItem TagType="ObservedDensityStatus"       DisplayName="Observed Density Status" />
391         <TagItem TagType="AirTemperature"              DisplayName="Air Temperature"           Units="Deg.C"/>
392         <TagItem TagType="AirTemperatureStatus"        DisplayName="Air Temperature Status" />
393         <TagItem TagType="VapourTemperature"           DisplayName="Vapour Temperature"        Units="Deg.C"/>
394         <TagItem TagType="VapourTemperatureStatus"     DisplayName="Vapour Temperature Status" />
395         <TagItem TagType="ObservedTemperature"         DisplayName="Observed Temperature"      Units="Deg.C"/>
396         <TagItem TagType="ObservedTemperatureStatus"   DisplayName="Observed Temperature Status" />
397         <TagItem TagType="CurrentLngDensity"           DisplayName="Current Lng Density"       Units="kg/l"/>
398         <TagItem TagType="CurrentLngDensityStatus"     DisplayName="Current Lng Density Status" />
399         <TagItem TagType="AlarmStatus1"                DisplayName="Alarm Status 1" />
400         <TagItem TagType="AlarmStatus2"                DisplayName="Alarm Status 2" />
401         <TagItem TagType="AlarmStatus3"                DisplayName="Alarm Status 3" />
402         <TagItem TagType="ServoStatus"                 DisplayName="Servo Status" />
403         <TagItem TagType="GaugeStatus"                 DisplayName="Gauge Status" />
404         <TagItem TagType="SystemStatus"                DisplayName="System Status" />
405         <TagItem TagType="EHGaugeStatus"               DisplayName="E+H Gauge Status" />
406         <TagItem TagType="GaugeMode"                   DisplayName="Gauge Mode" />
407         <TagItem TagType="ExtendedGaugeStatus"         DisplayName="Extended Gauge Status" />
408         <TagItem TagType="ElementTemperature"          DisplayName="Element Temperatures" />
409         <TagItem TagType="ElementTemperaturesStatus"   DisplayName="Element Temperatures Status" />
410         <TagItem TagType="StratificationStatus"        DisplayName="Stratification Status" />
411         <TagItem TagType="SkinTemperatures"            DisplayName="Skin Temperatures"         Units="Deg.C"/>
412         <TagItem TagType="SkinTemperaturesStatus"      DisplayName="Skin Temperatures Status" />
413         <TagItem TagType="UserDefinedAlarms"           DisplayName="User Defined Alarms" />
414       </Tank_Parameters>
415       <WmStatus TagType="WmStatus">
416         <TagItem TagType="VolumeCorrectionFactorStatus"   DisplayName="Volume Correction Factor Status" />
417         <TagItem TagType="TotalObservedVolumeStatus"      DisplayName="Total Observed Volume Status" />
418         <TagItem TagType="FreeWaterVolumeStatus"          DisplayName="Free Water Volume Status" />
419         <TagItem TagType="GrossObservedVolumeStatus"      DisplayName="Gross Observed Volume Status" />
420         <TagItem TagType="NetObservedVolumeStatus"        DisplayName="Net Observed Volume Status" />
421         <TagItem TagType="UsableVolumeStatus"             DisplayName="Usable Volume Status" />
422         <TagItem TagType="UllageVolumeStatus"             DisplayName="Ullage Volume Status" />
423         <TagItem TagType="GrossStandardVolumeStatus"      DisplayName="Gross Standard Volume Status" />
424         <TagItem TagType="NetStandardVolumeStatus"        DisplayName="Net Standard Volume Status" />
425         <TagItem TagType="StandardUsableVolumeStatus"     DisplayName="Standard Usable Volume Status" />
426         <TagItem TagType="StandardUllageVolumeStatus"     DisplayName="Standard Ullage Volume Status" />
427         <TagItem TagType="TotalGrossStandardVolumeStatus" DisplayName="Total Gross Standard Volume Status" />
428         <TagItem TagType="TotalCalculatedVolumeStatus"    DisplayName="Total Calculated Volume Status" />
429         <TagItem TagType="GrossMassStatus"                DisplayName="Gross Mass Status" />
430         <TagItem TagType="NetMassStatus"                  DisplayName="Net Mass Status" />
431         <TagItem TagType="UsableMassStatus"               DisplayName="Usable Mass Status" />
432         <TagItem TagType="UllageMassStatus"               DisplayName="Ullage Mass Status" />
433         <TagItem TagType="GrossWeightStatus"              DisplayName="Gross Weight Status" />
434         <TagItem TagType="NetWeightStatus"                DisplayName="Net Weight Status" />
435         <TagItem TagType="UsableWeightStatus"             DisplayName="Usable Weight Status" />
436         <TagItem TagType="UllageWeightStatus"             DisplayName="Ullage Weight Status" />
437         <TagItem TagType="ShellCapacityStatus"            DisplayName="Shell Capacity Status" />
438         <TagItem TagType="VapourStandardVolumeStatus"     DisplayName="Vapour Standard Volume Status" />
439         <TagItem TagType="VapourMassStatus"               DisplayName="Vapour Mass Status" />
440         <TagItem TagType="VapourWeightStatus"             DisplayName="Vapour Weight Status" />
441         <TagItem TagType="LiquidMassStatus"               DisplayName="Liquid Mass Status" />
442         <TagItem TagType="LiquidWeightStatus"             DisplayName="Liquid Weight Status" />
443         <TagItem TagType="TotalMassStatus"                DisplayName="Total Mass Status" />
444         <TagItem TagType="GaugedVolumeStatus"             DisplayName="Gauged Volume Status" />
445         <TagItem TagType="ProductDepthStatus"             DisplayName="Product Depth Status" />
446       </WmStatus>
447       <System TagType="System">
448         <TagItem TagType="DCCStartTime"          DisplayName="DCC Start Time" />
449         <TagItem TagType="RedundancyType"        DisplayName="Redundancy Type" />
450         <TagItem TagType="CurrentRedundancyMode" DisplayName="Current Redundancy Mode" />
451         <TagItem TagType="LastSwitchTime"        DisplayName="Last Switch Time" />
452         <TagItem TagType="LastSwitchReason"      DisplayName="Last Switch Reason" />
453         <TagItem TagType="LastSwitchPort"        DisplayName="Last Switch Port" />
454       </System>
455       <Port_Data TagType="Port_Data">
456         <TagItem TagType="PortNumber"            DisplayName="Port Number" />
457         <TagItem TagType="Slave"                 DisplayName="Slave" />
458         <TagItem TagType="Active"                DisplayName="Active" />
459         <TagItem TagType="Protocol"              DisplayName="Protocol" />
460         <TagItem TagType="Parameters"            DisplayName="Parameters" />
461         <TagItem TagType="NumberOfDevices"       DisplayName="Number Of Devices" />
462         <TagItem TagType="PollCount"             DisplayName="Poll Count" />
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463         <TagItem TagType="ValidReplyCount"       DisplayName="Valid Reply Count" />
464         <TagItem TagType="TimeoutCount"          DisplayName="Timeout Count" />
465         <TagItem TagType="InvalidReplyCount"     DisplayName="Invalid Reply Count" />
466         <TagItem TagType="LastRequestTime"       DisplayName="Last Request Time" />
467         <TagItem TagType="LastResponseTime"      DisplayName="Last Response Time" />
468         <TagItem TagType="ConnectionStatus"      DisplayName="Connection Status" />
469         <TagItem TagType="Connected"             DisplayName="Connected" />
470         <TagItem TagType="CommsValid"            DisplayName="Comms Valid" />
471         <TagItem TagType="Tunneling"             DisplayName="Tunneling" />
472         <TagItem TagType="ConnectionType"        DisplayName="Connection Type" />
473         <TagItem TagType="MaxRetries"            DisplayName="Max Retries" />
474         <TagItem TagType="PollDelayTime"         DisplayName="Poll Delay Time" />
475         <TagItem TagType="BackgroundScanPeriod" DisplayName="Background Scan Period" />
476         <TagItem TagType="CommsTimeout"          DisplayName="Comms Timeout" />
477       </Port_Data>
478     </Duty>
479   </TankId>
480 </Tags>
```

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