How to use TM Trend Analysis?

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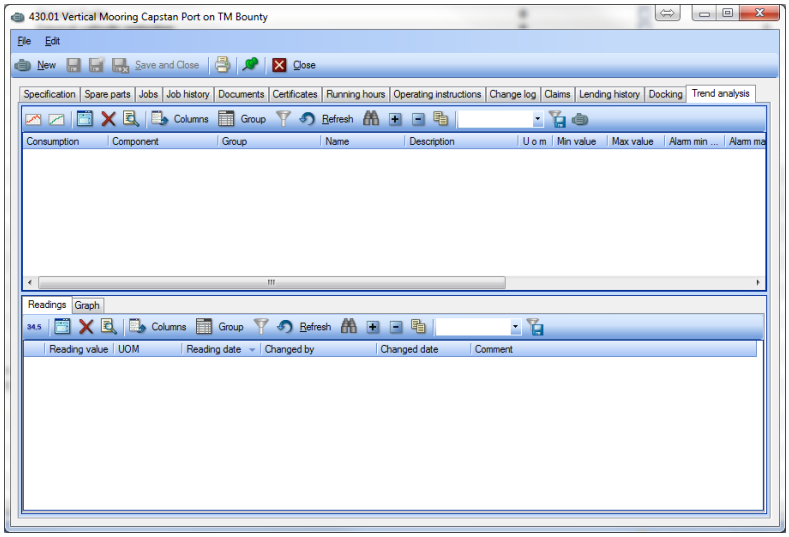
Revised 01.09.2020

How to add a new measurement to a component?

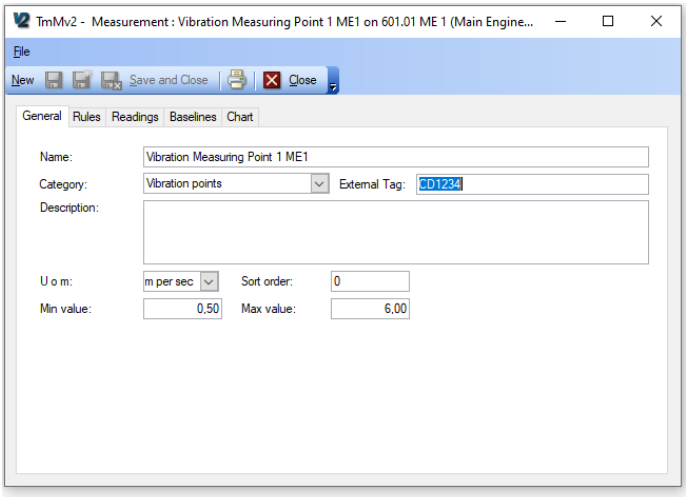
1. Click [Inventory] → [Components]
2. Double click the component you want to add a measurement to.
3. Click the 'Trend analysis' tab.



There are two types of measurements:

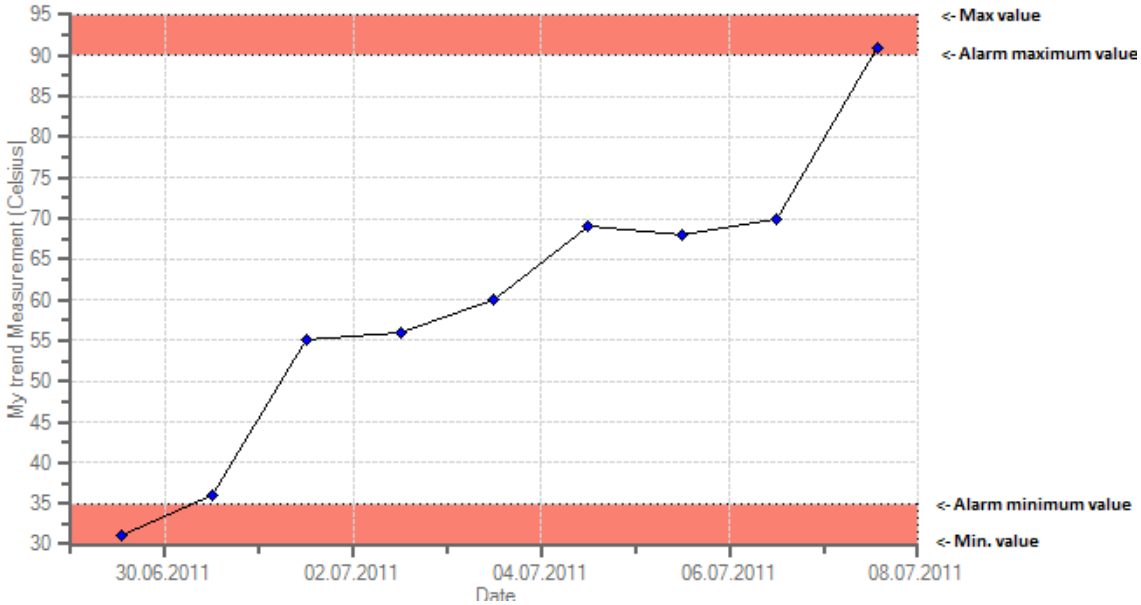
	Trend	(step 4-5)
	Consumption	(step 6-7)

4. To add a Trend measurement, click the Trend icon  found to the top left menu.



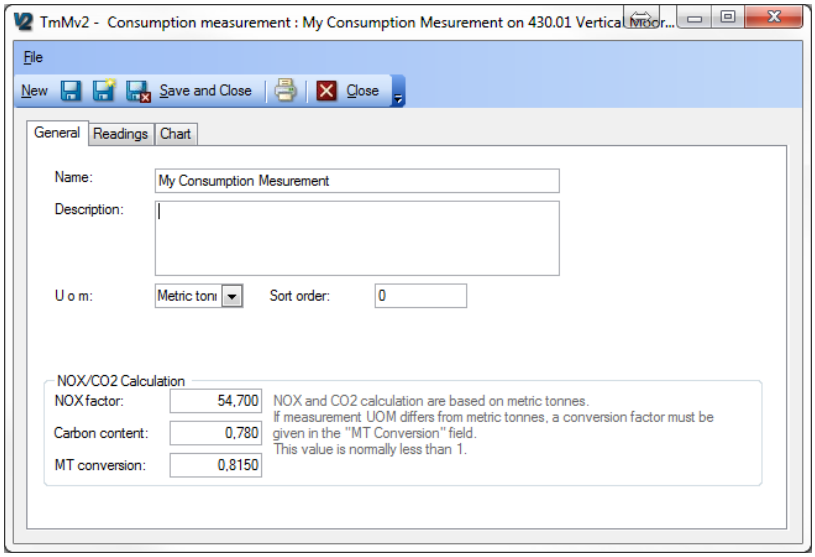
5. Enter the trend measurement values.
   5.1. Enter a **Name**, so that all users know what this measurement is measuring.
   5.2. Enter a **Description** of the measurement, so that all users involved will understand what it is supposed to measure.
   5.3. Select a **Unit of Measurement** (UOM)

5.4. The **Sort order** value lets you create an alternative sort order of your measurements if required.
5.5. Enter a **Minimum value**. (The minimum value is the lowest value for the X axis in the chart.)
5.6. Enter a **Max value**. (The maximum value is the highest value for the X axis in the chart.)
5.7. Enter an '**Alarm min. value**'. This is entered by going to the 'Rules' tab – please see the 'How to add a rule to a measurement' section below. The Alarm min. is the lowest 'acceptable' value for this measurement. If a value lower is entered as a reading, the system will ask the user if a corrective action should be created. The area in the graph view between 'Min value' and 'Alarm min value' is colored red. (As shown below)
5.8. Enter an '**Alarm max. value**'. This is entered by going to the 'Rules' tab – please see the 'How to add a rule to a measurement' section below. The Alarm max. is the highest 'acceptable' value for this measurement. If a value higher is entered as a reading, the system will ask the user if a corrective action should be created. The area in the graph view between 'Max value' and 'Alarm max value' is colored red. (As shown below)



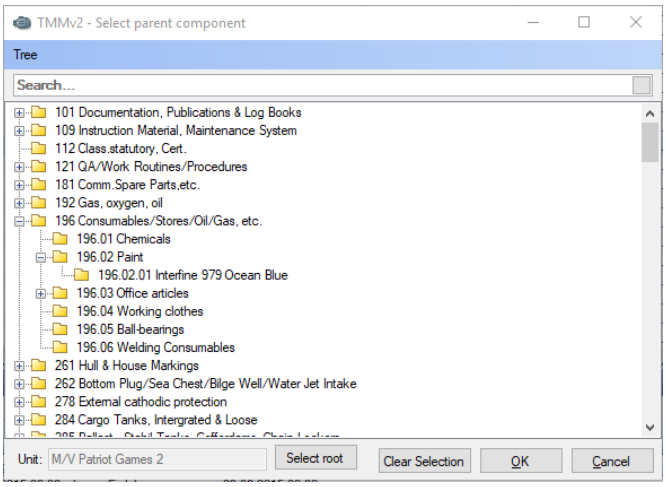
Please note that the graph will be scaled based upon the highest and lowest readings entered, in some cases you will not be able see the Alarm max and minimum value borders in the graph.

6. To add a Consumption measurement, click on the consumption icon found to the left on the toolbar.



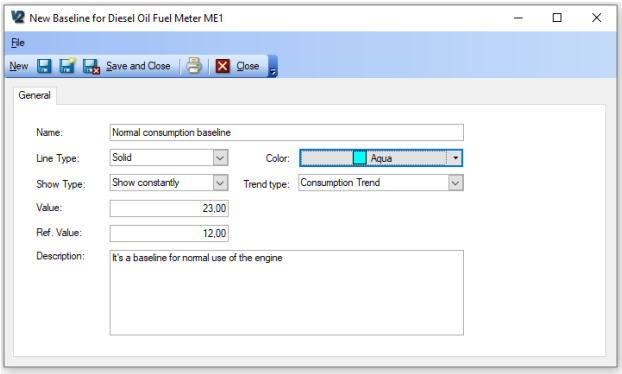
7. Enter the consumption measurement settings.
   7.1. Enter a **Name** describing the consumption measurement.
   7.2. Enter a **Description** of the measurement, so that all users involved will understand what it is supposed to measure.
   7.3. Select an appropriate **Unit of Measurement**. (UOM)
   7.4. If the consumption produces NOX/CO^2 you can enter the NOX factor, carbon content, and MT conversion. This can be used to calculate your NOX/CO^2 emissions later on.

Note: Trend & Consumption measurements can also be created directly from the Trend module. The user is presented with the component structure immediately after clicking the add trend or the add consumption button



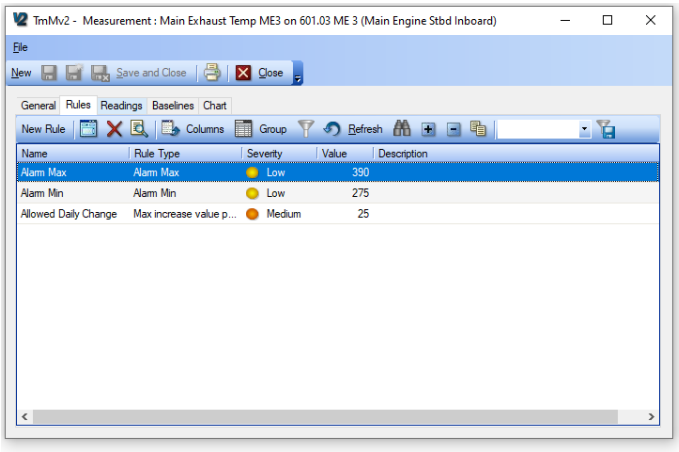
How to Add a Baseline to a Measurement

1. Click [Inventory] → [Trend Analysis]
2. Double click the measurement you want to add a baseline to
3. Select the 'Baselines' tab
4. Click [New Baseline]



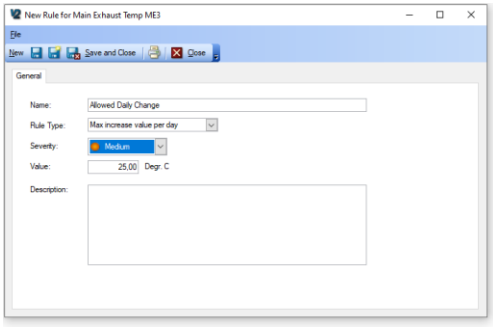
5. Add a **Name**
6. Select a **Line Type**
7. Select a **Color**
8. Select a **Show Type**
9. Add a **Value** (this is the value of the baseline)
10. Add a **Ref value**, if desired (this is for filtering purposes)
11. Add a **Description**, if desired
12. Select a **Trend Type** (For Consumption measurements only)
13. Click [Save and Close]

How to Add a Rule to a Measurement

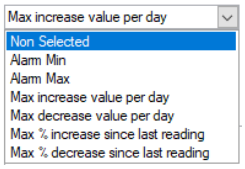


1. Click [Inventory] → [Components]
2. Double click the component you want to add the rule to.
3. Click the 'Trend analysis' tab.

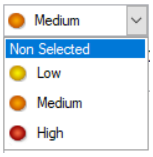
4. Double click the measurement you wish to add a rule to
5. Click the ‘Rules’ tab
6. Click [New Rule]



7. Enter the Rule values measurement settings.
   7.1 Enter a **Name** describing the Rule
   7.2 Select the **Rule type**.

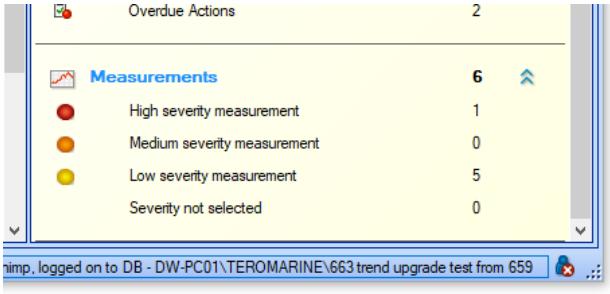


   7.3 Select the **Severity**



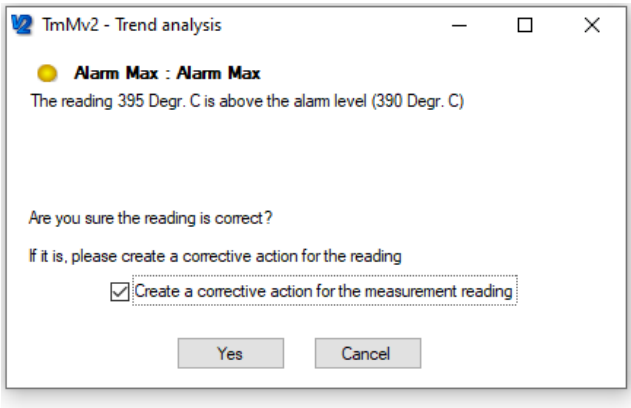
   7.4 Enter a **Value** for the rule type
   7.5 Enter any additional **Description**, if required
   7.6 Click [Save and Close]

Note: Measurements that currently have a reading that has broken a rule are shown on the Ship → Overview

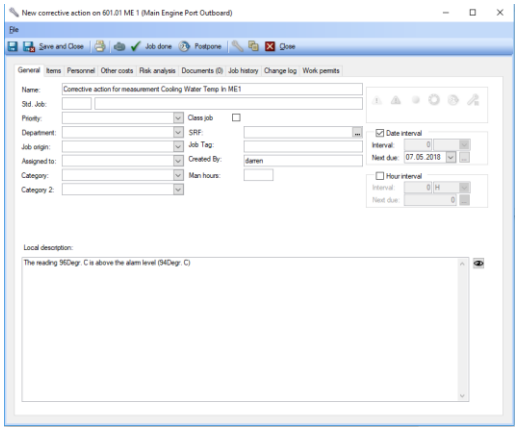


Corrective actions for trend readings break rules

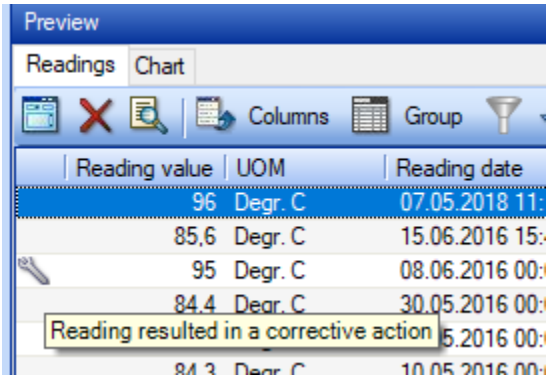
When a value is registered that breaks a rule (for example, it is either above the 'Alarm max value' or below the 'Alarm min value'), the user is presented with a message similar to the following

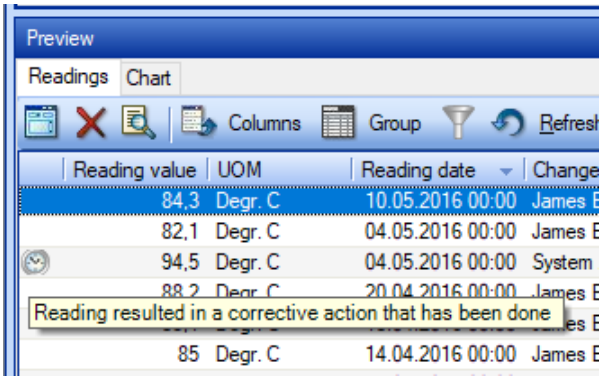


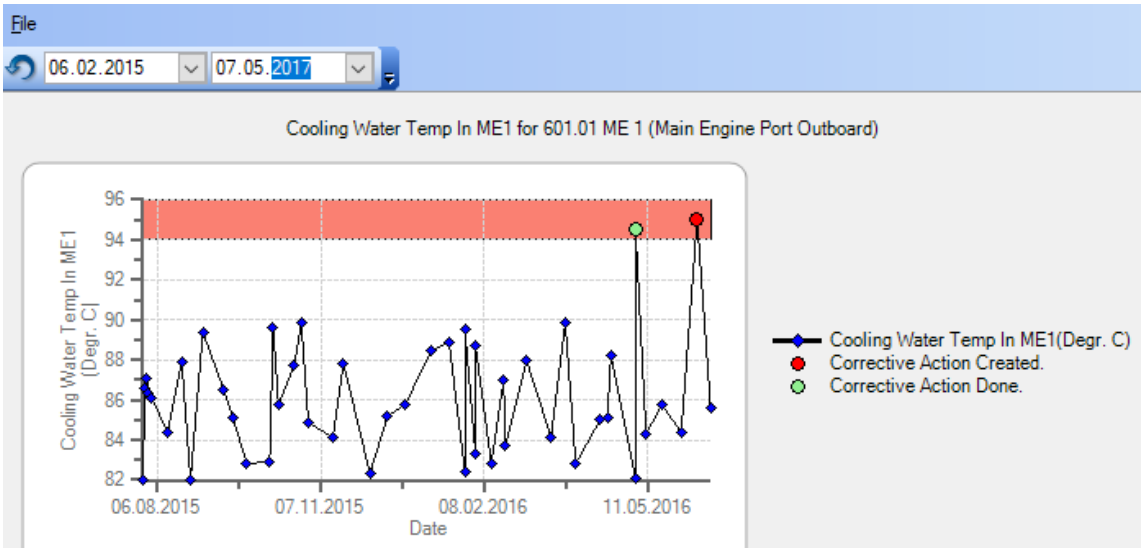
If the user chooses to continue and leaves the corrective action creation ticked. A ONE job will be automatically created for the reading with today's date as the due date. The value of the reading and the rule value that has been breached are inserted as part of the description for the job, but users may enter extra text as they see fit.



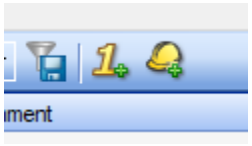
Readings that have resulted in corrective actions are indicated both in the grid list of readings and in the graphs as shown below



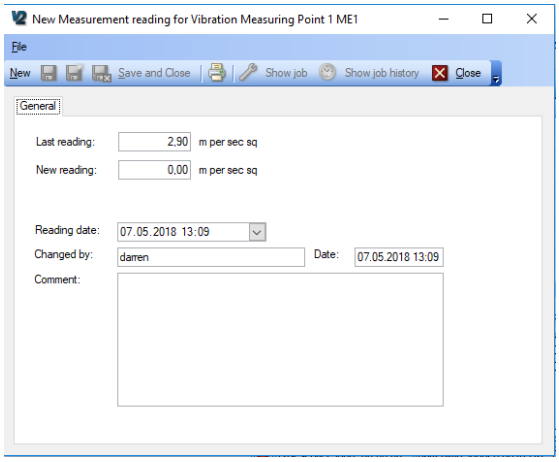




Note: It is also possible to add a ONE job or a Job History to any reading at any time using the relevant buttons on the toolbar



How to Add a reading to a measurement



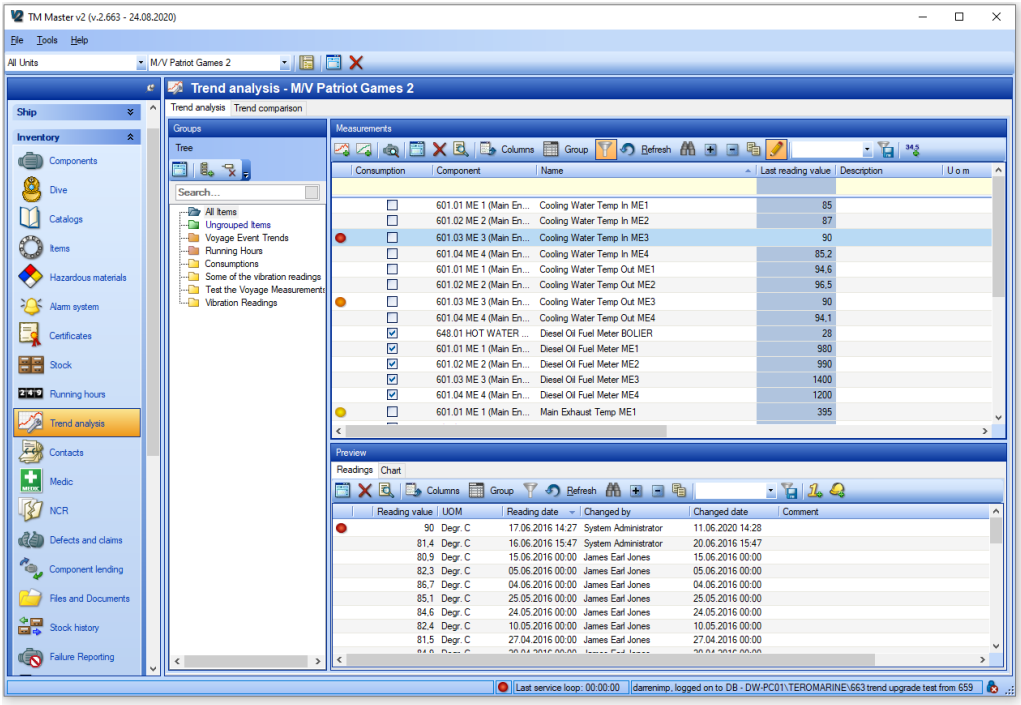
1. Click [Inventory] → [Component]
2. Double click the component you want to add the reading to.
3. Click the 'Trend analysis' tab.

4. Double click the measurement you wish to add a reading to
5. Select the ‘Readings’ tab
6. Click the Add New Reading  button
7. Fill in the **New reading**
8. Set the **reading date** and time
9. Write a **comment** if desired
10. Click [Save and Close]

Note: Consumption measurement readings have the possibility to enter the ‘Consumption since last’. Figures entered into this field, will automatically fill out the new reading field as ‘Last reading’ + ‘Consumption since last’.

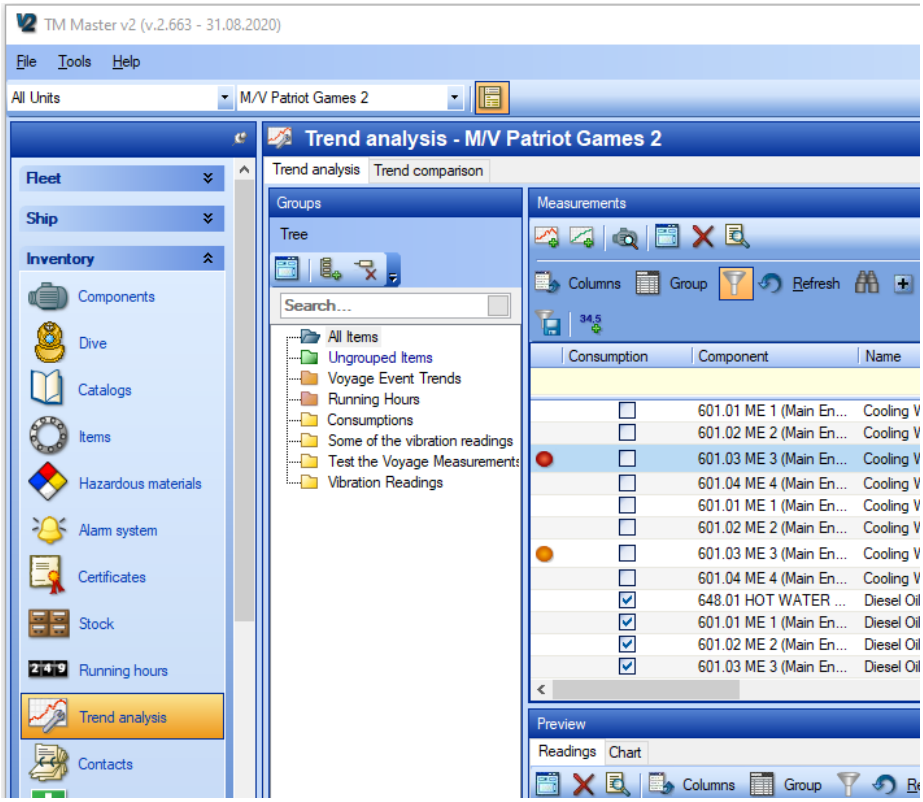
How to enter readings directly in the grid

It’s possible to enter readings for measurements directly into the trend analysis overview grid. Readings entered here will automatically be registered with the current date and time.

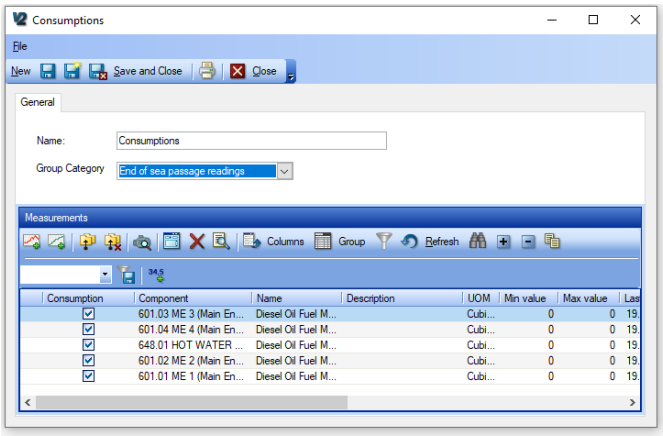


1. Click [Inventory] → [Trend Analysis]
2. Click the Edit Grid  button
3. The Last reading column will now be highlighted, enter the values accordingly

How to Create Measurement Groups



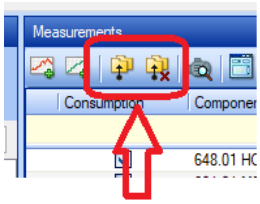
1. Click [Inventory] → [Trend Analysis]
2. Click the Add Root Node  button



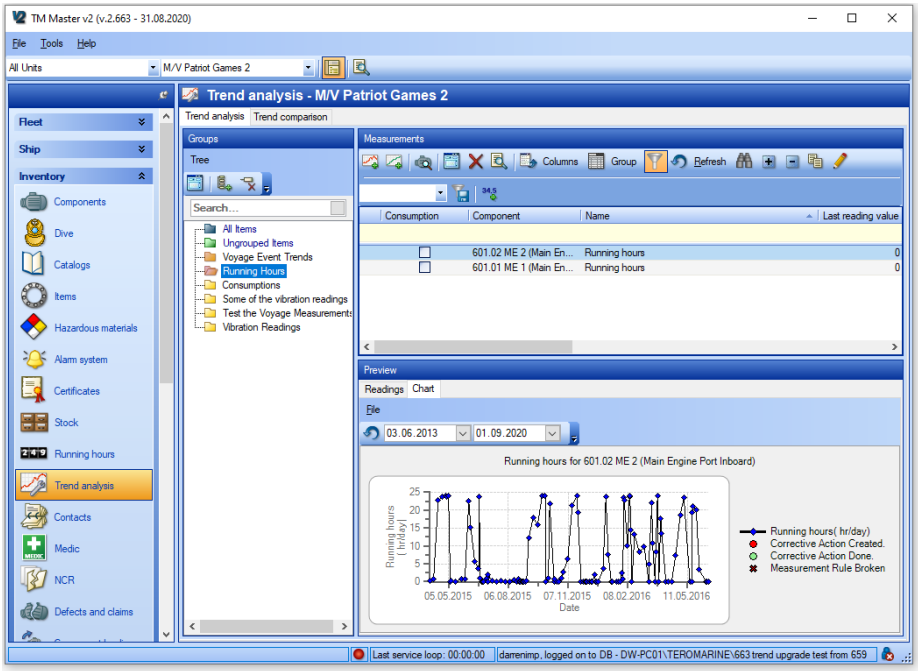
3. Type a **Name** for the group
4. Select a **Group Category** (if appropriate)
5. Click [Save and Close]

Measurements can then be added to the groups by dragging them from the upper right pane and dropping them on the group in the structure pane.

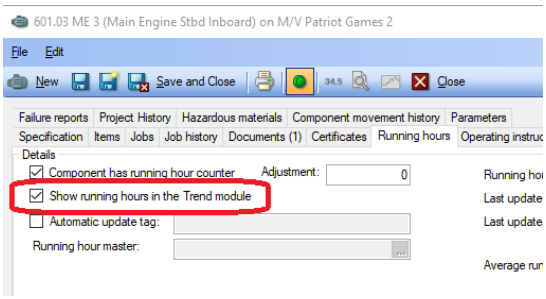
Note: Measurements can be linked to several groups at the same time. When viewing the contents of a specific group, two additional buttons are available on the toolbar for connecting and disconnecting measurements



How to Show a Component's Running Hours in the Trend Module



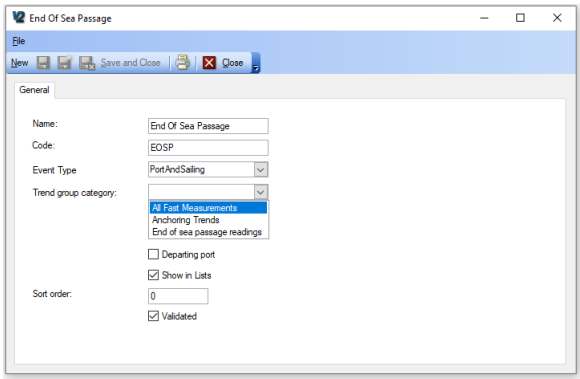
1. Click [Inventory] → [Component]
2. Double click the component you want to add to the Trend Running Hours group.
3. Select the "Running Hours" tab.
4. Tick the 'Show Running Hours in the Trend module' check box



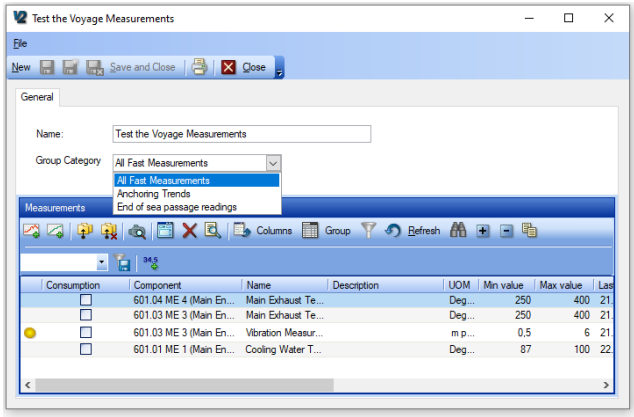
5. Click [Save and Close]

How to Apply Trend Groups to Voyage Event Type

1. Click [Administration] → [Codes]
2. Select the 'Voyage Event' code table from the drop down.
3. Double click the voyage event code that you wish to link to trend groups.
4. Select the 'Trend Group Category'



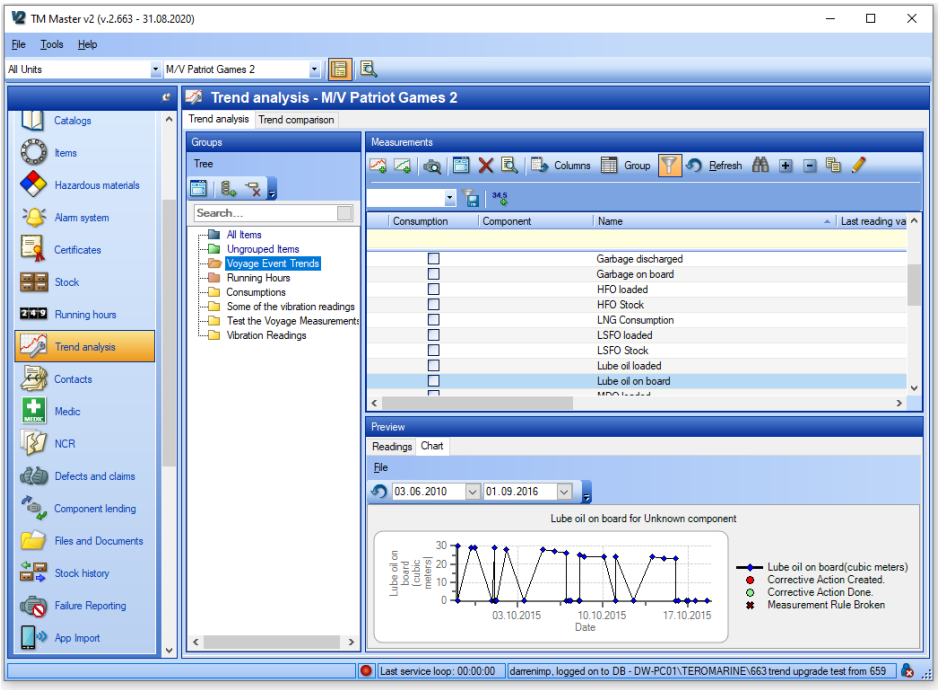
5. Click [Save and Close]
6. Click [Inventory] → [Trend analysis]
7. Find the trend group that you wish to use for the voyage event code
8. Right click and select [Open]
9. Select the same group category as you did for the voyage event code



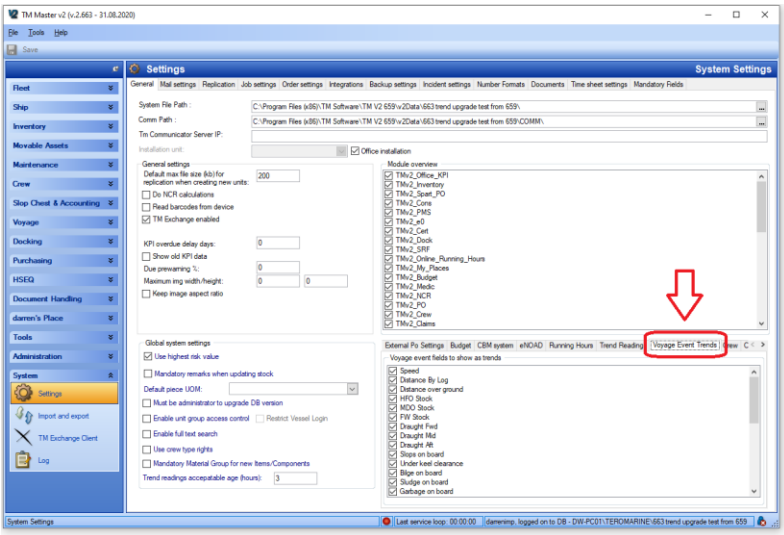
10. Click [Save and Close]

Note: Through the use of the trend group categories it is possible to link several trend groups to one particular voyage event code.

How to Show Voyage Event Fields as Trends



1. Click [System] → [Settings]
2. On the 'General' Tab, select the 'Voyage Event Trends' sub tab

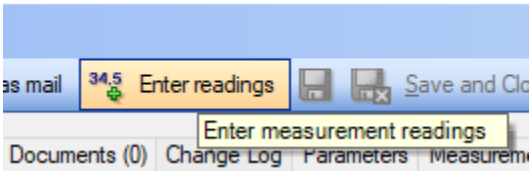


3. Tick the Voyage Event Fields that you wish to see in the trend module
4. Click [Save]

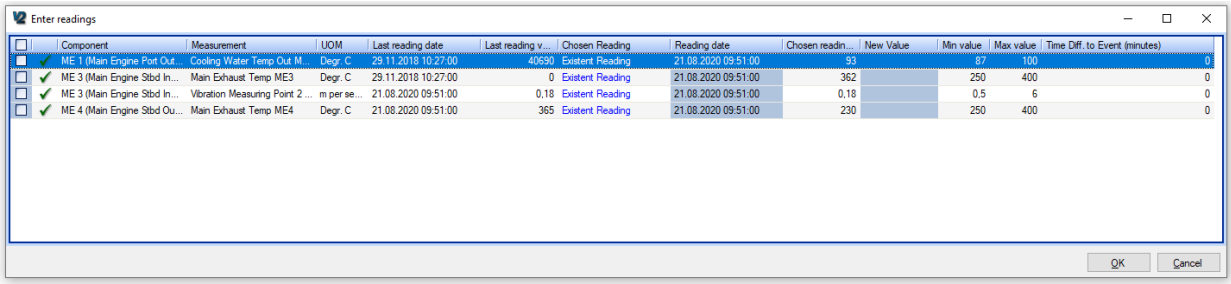
Note: This is a global setting for all units in the fleet

How to Register Readings from a voyage event

1. Click [Voyage] → [Current Voyage Log]
2. Double click or create an event that requires readings
3. If there are readings required, the Enter Readings button will be active

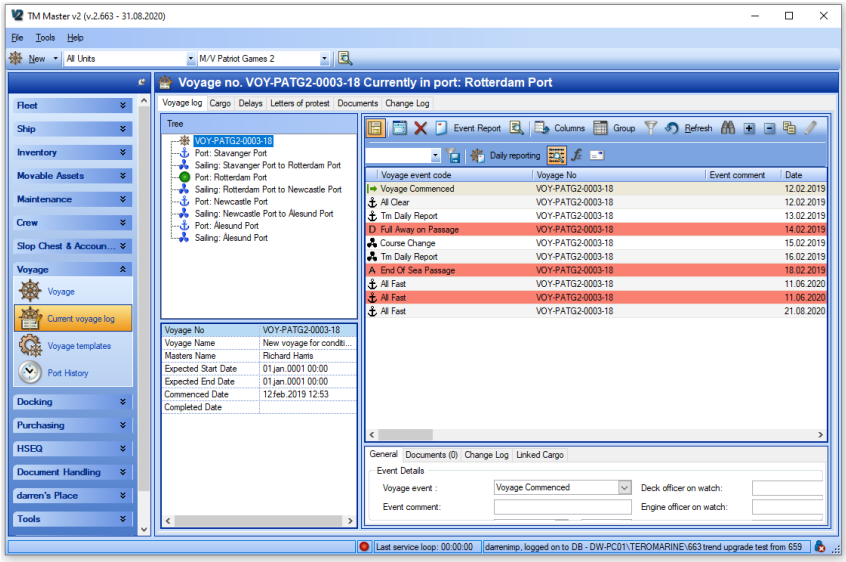


4. Click the [Enter Readings] button

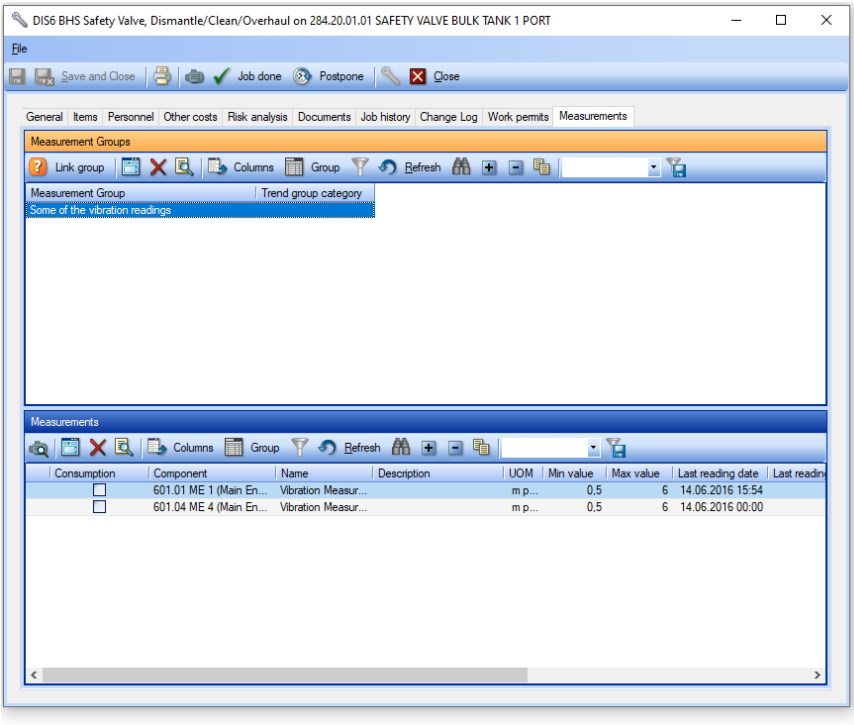


5. Enter New readings in the New Value column
   Or
   Click the selector button in the Reading Date column to choose from existing readings
6. Tick the Check Boxes to select which readings to register
7. Click [OK]

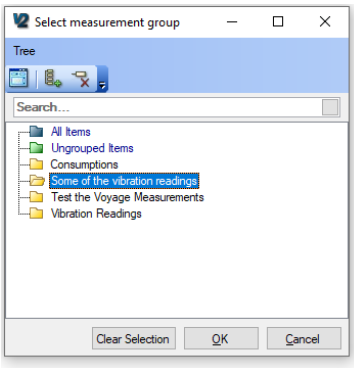
Note: Any events that require readings that have not had all the required readings registered will be highlighted in a red colour in the voyage event grid



How to Add a Trend Group to Component Job



1. Click [Maintenance] → [Due]
2. Double click the component job you want to add the Trend Group to.
3. Select the 'Measurements' tab.
4. Click the [Link Group] button

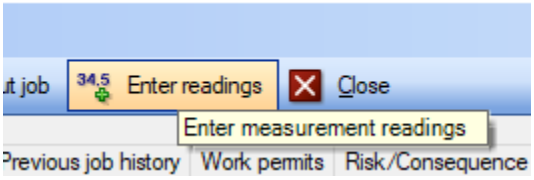


5. Select the group you want to link and click [OK]

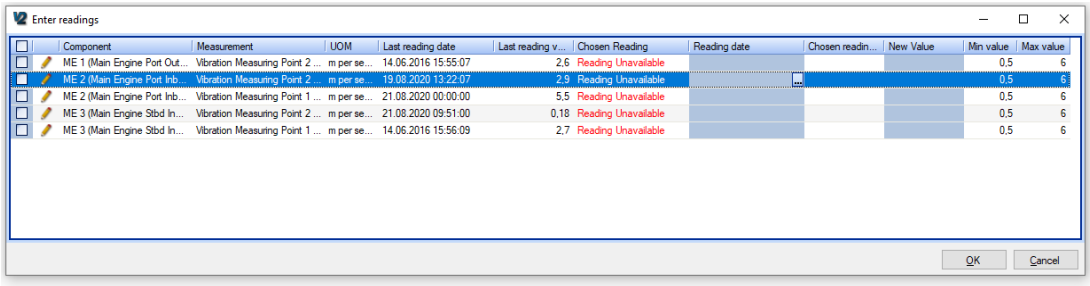
Note: Once a measurement group is attached to a component job, users will be required to enter readings for the measurements as part of the sign out process.

How to Register Readings from a component job signing out process

1. Click [Maintenance] → [Due]
2. Select a job that requires readings
3. Click [Job Done]
4. If there are readings required, the Enter Readings button will be active



5. Click the [Enter Readings] button



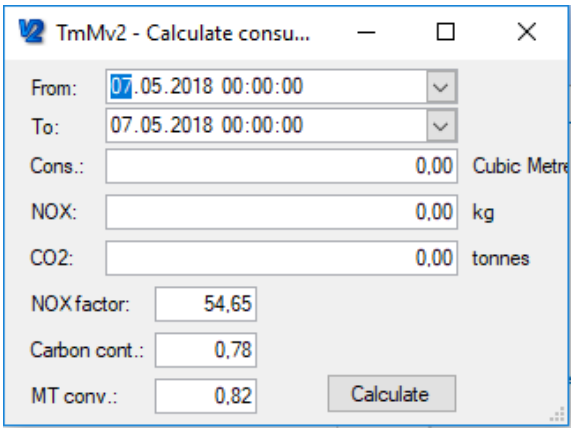
6. Enter New readings in the New Value column

   Or

   Click the selector button in the Reading Date column to choose from existing readings
7. Tick the Check Boxes to select which readings to register
8. Click [OK]

How to Calculate CO2 & NOX for consumption measurements

1. Click [Inventory] → [Component]
2. Double click the component you want to calculate NOX / CO2 for
3. Click the 'Trend analysis' tab.
4. Double Click the relevant Consumption Measurement
5. Select the Chart tab
6. Click the  button



7. Set the **From** & **To** dates accordingly
8. Click [Calculate]

The consumption in the chosen UOM, the NOX production in kilograms and the CO2 production in metric tons should now be shown for the chosen time period

Note: An additional function has been added to the voyage module where the user can select two events from the voyage log which will then calculate NOX/CO2 between the two chosen event times for all registered consumption measurements for the unit.

The NOX / CO2 calculation

To achieve the desired results from the NOX/CO2 calculation, a number of figures must be in place.

1. Registered Consumption readings both before and after the chosen time period
2. A NOX factor figure
3. A Carbon Content figure
4. An MT Conv figure

If the user only wishes to calculate consumption, then only number 1 of the above list is required.

NOX Factor: This a figure which is specific to a piece of equipment and is derived from test data for the equipment. It basically indicates how much NOX a piece of equipment will generate for a given amount of fuel.

Carbon Content: This figure represents the amount of carbon in the fuel that is used for a standard unit of measurement. For example, if the carbon content of the fuel is 56,3%, then the Figure entered in the Carbon Content filed should be 0,563

MT Conv figure: This figure is used to convert the reading figures to metric tons. Typically, flow meters attached to engines measure the volume of fuel used by the engine, so this needs to be converted to metric tons. The MT Conv figure should be used, taking into account both the density of the fuel and the unit of volume that is utilized (for cubic metre readings, the MT Conv figure should be the density. For any other unit of volume and additional volume conversion needs to be factored into the MT Conv figure)

The three figures presented to the user are calculated according to the following equations

Cons (chosen UOM) = Diff. between consumption readings at chosen times

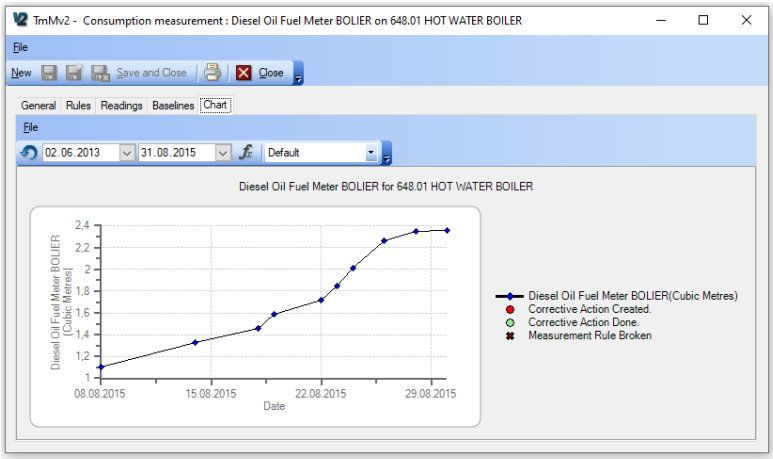
NOX (kilograms) = Cons * MT Conv * NOX Factor

CO2 (metric tons) = Cons * MT Conv * 3.664 * Carbon Content

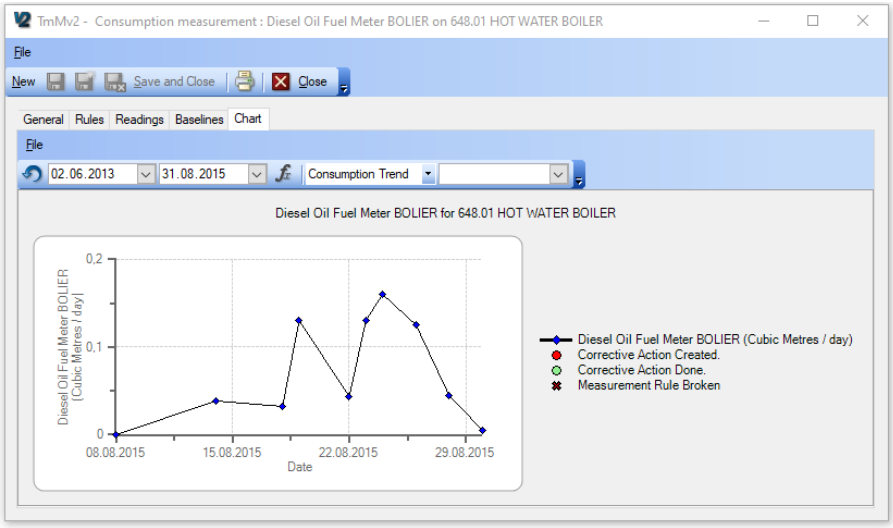
Consumption, NOX and CO2 charts

To enable the possibility to use baselines (see section 'How to Add baselines') in connection with consumption measurements, 3 extra charts have been added to the 'Chart tab'. These charts utilise the calculation methods described above, to show the readings from a different perspective.

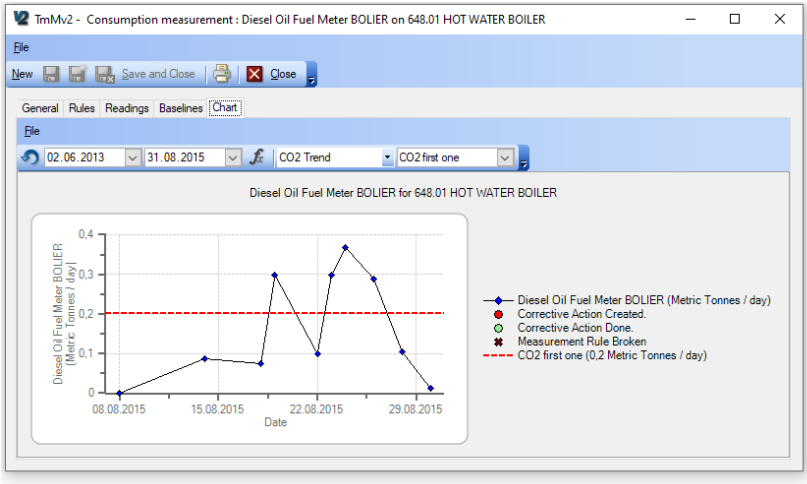
The 'Default' chart is a straight representation of the consumption readings



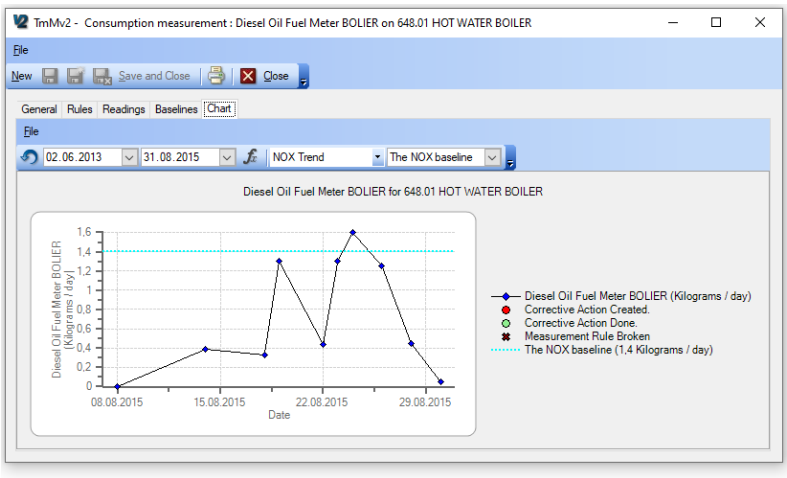
The 'Consumption Trend' chart is based on a calculation of difference in quantity from each reading to the previous reading, divided by the time between the two readings to give an average per day figure.



The ‘CO2 Trend’ chart uses the CO2 calculation method (detailed in ‘The NOX / CO2 calculation’ section) based on the consumption calculated from the difference in quantity from each reading to the previous reading. This is divided by the time between the two readings to give an average per day figure.

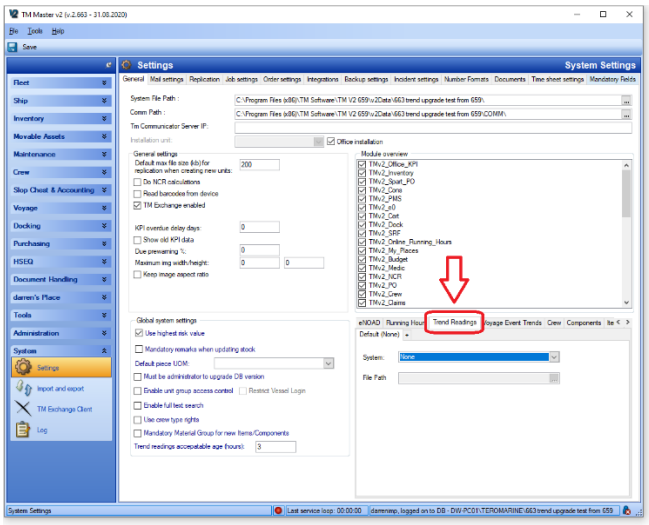


The ‘NOX Trend’ chart uses the NOX calculation method (detailed in ‘The NOX / CO2 calculation’ section) based on the consumption calculated from the difference in quantity from each reading to the previous reading. This is divided by the time between the two readings to give an average per day figure.



How to set up the Import of Readings from an External System

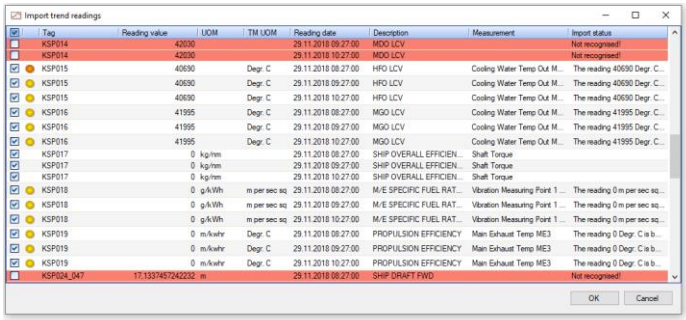
1. Click [System] → [Settings]
2. On the 'General' Tab, select the 'Trends Readings' sub tab



3. Select which system you want to import from
4. Set the 'File Path' to the readings file
5. Click [Save]
6. Restart Tm Master V2

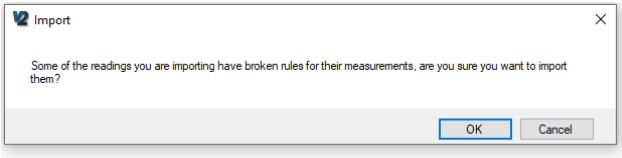
How to Import Trend Readings from an External System

1. Click [Inventory] → [Trend Analysis]
2. Click the Import trend readings  button



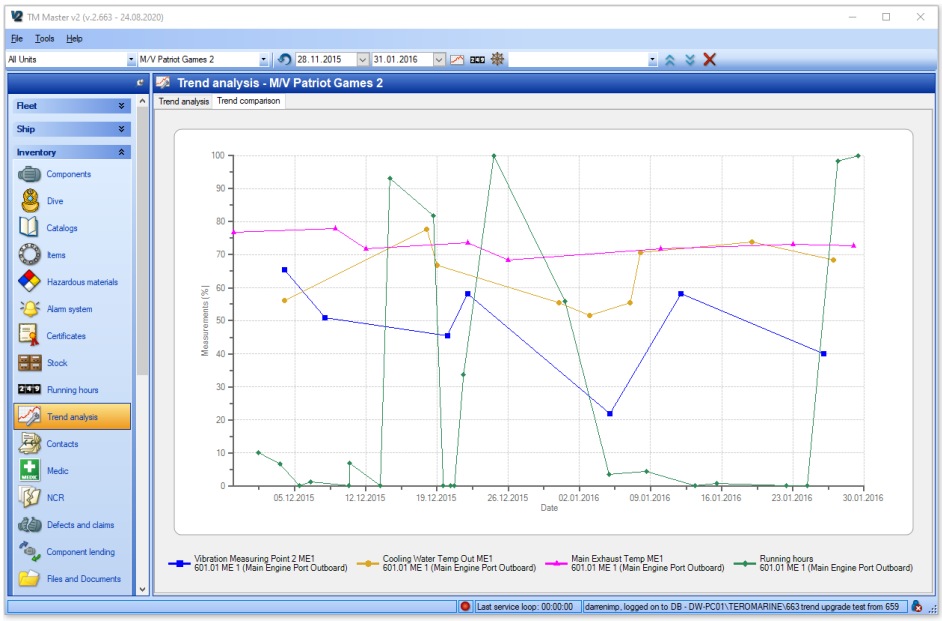
3. Tick the Readings you wish to import
4. Click [OK]

If any of the readings have broken rules, you will receive this warning

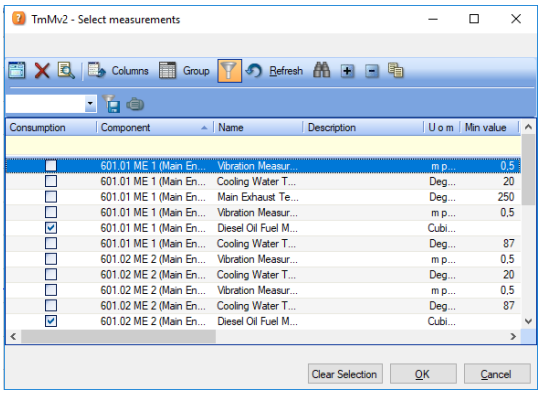


5. Click [OK] if you wish to proceed without changes

How to Compare trends & consumptions



1. Click [Inventory] → [Trend Analysis]
2. Select the 'Trend Comparison' tab
3. Click the Add Measurements button



4. Select the measurements you wish to compare
5. Click [OK]
6. Adjust the date range accordingly

Note: It is also possible to display the running hours for several components within the trend comparison chart by clicking the Add Running Hours button. In combination with use of the voyage module, there is also the facility to view Voyage Event field trends in the comparison graph by clicking the Voyage trend button