Thickness Monitoring

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Chapter

1

Overview

Topics:

Overview of the Thickness Monitoring (TM) Module

Thickness Monitoring (TM) is a module in GE Digital APM that allows you to document, manage, and analyze corrosion data used to predict the remaining usable life for an asset. It provides the tools that you need to monitor the corrosion of the asset in your plant and to take preventative actions that will help you avoid the economic, environmental, and human costs of corrosion-related failures.

Access the Thickness Monitoring Overview Page for a Selected Hierarchy Level

Before You Begin

- You can access the **Thickness Monitoring Overview** page only if you are a member of one of the following Security Groups:

  ◦ MI Thickness Monitoring Administrator
  ◦ MI Thickness Monitoring Inspector
  ◦ MI Thickness Monitoring User

  You can perform the various tasks in this page based on the privileges granted to these Security Groups.

Procedure

1. In the main navigation bar, select .
   The Asset Hierarchy appears.

2. Navigate to the hierarchy level for which you want to access the **Thickness Monitoring Overview** page.

    A list of types of analyses performed on assets in the selected hierarchy level appears in the workspace, in the **Health** section.
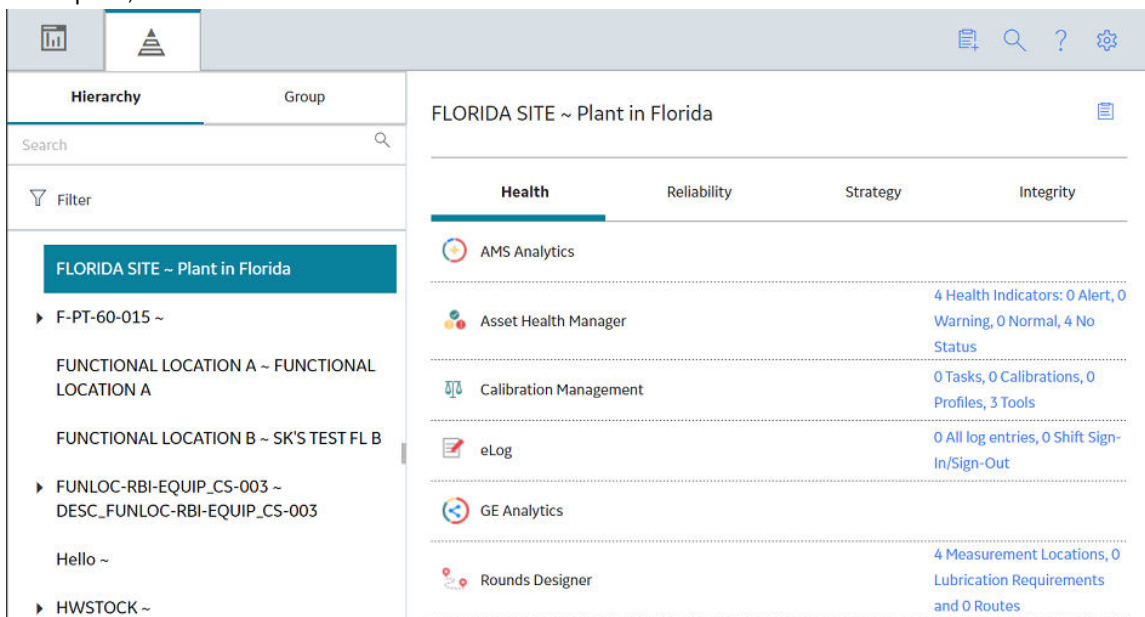
3. In the workspace, select the **Integrity** tab.

    The **Integrity** section appears, displaying a list of the functions performed on the selected hierarchy level.

Note: In the **Thickness Monitoring** row, the counts listed for TML Groups and TMLs only lists records that are directly linked to the parent asset.

4. Select the link in the **Thickness Monitoring** row.
   The **Thickness Monitoring Overview** page appears, displaying the following information that corresponds only to the selected hierarchy level.

   Note: If you have selected an asset instead of a hierarchy level (that is, functional location), instead of the **Thickness Monitoring Overview** page, the **TM** page appears, displaying the **Corrosion Analysis Settings** workspace.

   • **The Corrosion Rate Distribution graph:** Plots the corrosion rate values of assets.
   • **The Remaining Life graph:** Plots the remaining life values of assets.
   • **The TM Tasks section:** Displays a list of Thickness Monitoring tasks, sorted by the value in the Next Date field.
   • **The Degradation Distribution section:** Displays a list of Degradation Mechanisms and RBI Analyses linked to each asset.
   • **The Assets section:** Displays a list of Equipment and Functional Locations in the selected hierarchy level that are linked to Corrosion Analysis Settings. If you want to include an asset in this list, you will first need to create Corrosion Analysis Settings for that asset. If you have loaded data using the Thickness Monitoring (TM) Data Loaders, then this list is updated to display the assets that have been added or updated via the data loader workbook.
   • **The Assets Requiring a Calculation section:** Displays a list of assets that have not been calculated. If you have loaded data using the Thickness Monitoring (TM) Data Loaders, then this list is updated to display the assets that have been added or updated via the data loader workbook.
   • **The Thickness Inspections section:** Displays the asset controlling next inspection date specified in a Thickness Inspection linked to each asset.
   • **The Excessive Corrosion section:** Displays the controlling corrosion rate values of assets with high rates of corrosion.
   • **The Assets Near or Past Retirement section:** Displays a list of assets that are near or past retirement.

Optionally, if you have configured Thickness Monitoring to link Functional Locations directly with TMLs and TML Groups, in the workspace, you can select ⬈ to access the Functional Location in the **Analysis Overview** workspace.

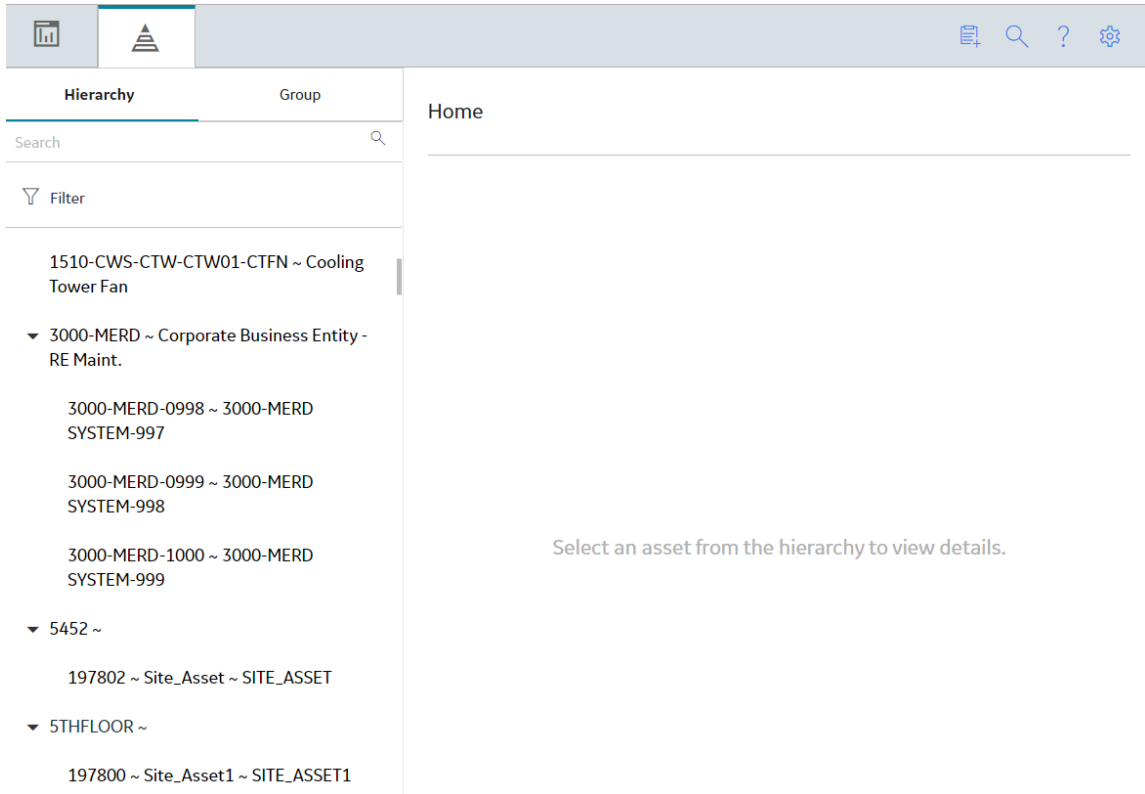# Access the Thickness Monitoring Overview Page for all Hierarchy Levels

Before You Begin

- You can access the **Thickness Monitoring Overview** page only if you are a member of one of the following Security Groups:
  - MI Thickness Monitoring Administrator
  - MI Thickness Monitoring Inspector
  - MI Thickness Monitoring User

You can perform the various tasks on this page based on the privileges granted to these Security Groups.

Procedure

In the module navigation menu, select **Integrity** > **Thickness Monitoring**.
The **Thickness Monitoring Overview** page appears, displaying the following information for all hierarchy levels.

- The **Corrosion Rate Distribution** graph: Plots the corrosion rate values of assets.
- The **Remaining Life** graph: Plots the remaining life values of assets, up to 180 months.
- The **TM Tasks** section: Displays a list of Thickness Monitoring tasks, sorted by the value in the Next Date field.
- **The Degradation Distribution section:** Displays a list of Degradation Mechanisms and RBI Analyses linked to each asset.
- **The Assets section:** Displays a list of Equipment and Functional Locations. If you have loaded data using the Thickness Monitoring (TM) Data Loaders, then this list is updated to display the assets that have been added or updated via the data loader workbook.
- **The Assets Requiring a Calculation section:** Displays a list of assets that have not been calculated. If you have loaded data using the Thickness Monitoring (TM) Data Loaders, then this list is updated to display the assets and functional locations that have been added or updated via the data loader workbook.
- **The Thickness Inspections section:** Displays the asset controlling next inspection date specified in a Thickness Inspection linked to each asset.
- **The Excessive Corrosion section:** Displays the controlling corrosion rate values of assets with high rates of corrosion.
- **The Assets Near or Past Retirement section:** Displays a list of assets that are near or past retirement.

Next Steps

[Create Corrosion Analysis Settings](#)

Thickness Monitoring (TM) Workflow

The following workflow provides the basic, high-level steps for using TM. The steps and links in this workflow do not reference every possible procedure.

1. Determine the assets in your plant that need to be monitored for corrosion.
2. Create corrosion analysis settings for each asset.
3. For each asset that will be monitored, identify one or more Thickness Measurement Locations (TMLs) that will be contained in a TML Group.
4. After you have identified the TMLs, record Thickness Measurement readings for each TML. These readings can be recorded via data entry or datalogger.

5. After you record measurements for the TMLs, calculations are made based on those measurements. TM allows you to select different inspection types for your analyses, as well as use multiple types of analyses at once. Using the measurement data, TM can calculate the corrosion rate, the Next Inspection Date, and the Remaining Life for equipment. The calculations can help determine when to repair or replace the asset.

In addition to facilitating the basic analysis workflow described above, TM also provides other tools and features that help you manage your corrosion data and monitor your asset, including:

-   The Minimum Thickness (T-Min) Calculator, which is designed to calculate the minimum thickness for certain types of components. The T-Min value is used to determine the corrosion rate, remaining life, and next inspection date for the component. The T-Min Calculator is available for piping, pressure vessels, and tanks, and is compliant with ANSI B31 (for piping), API 653 (for tanks), and ASME Section VIII DIV 1 and NBIC NB23, API 510 (for pressure vessels).
-   An interface for handheld data recorders (dataloggers) manufactured by Olympus and GE. This allows measurement readings that have been recorded in the field to be uploaded automatically to TM. Additionally, data stored in the application can be downloaded to handheld devices.

TM Best Practice

TM Best Practice specifies that you will create analyses for an asset and its components only. You should not create analyses for locations. If you are following Enterprise APM Best Practice, your asset information will be stored in Equipment records, which serve as the root records for your corrosion analyses.

Additionally, TM Best Practice specifies that you can organize your equipment by defining components of the asset. TML Groups should be used to represent the components of the asset at this level.

Chapter

2

Workflows

Topics:

Thickness Monitoring Planning Workflow

Thickness Monitoring: TM Planning Workflow

The TM Planning process requires defining all of the elements required to implement and execute a comprehensive TM inspection plan. This includes identifying the relevant assets for TM and how they are subject to different corrosion environments.

For example, a heat exchanger is typically subject to two different process streams. One stream may be a fluid or gas with minimal corrosive properties, while the other may be a fluid or gas with highly corrosive properties. In this case, the Corrosion Analyst may define two corrosion groups with different analysis properties to assess wall thickness. Once the corrosion groups have been established, the Corrosion Analyst will identify the measurement locations needed to properly assess the current wall thickness and project future remaining life.

In the following workflow diagram, the blue text in a shape indicates that a corresponding description has been provided in the sections that follow the diagram. For more information, refer to the topic Interpreting the Workflow Diagrams.
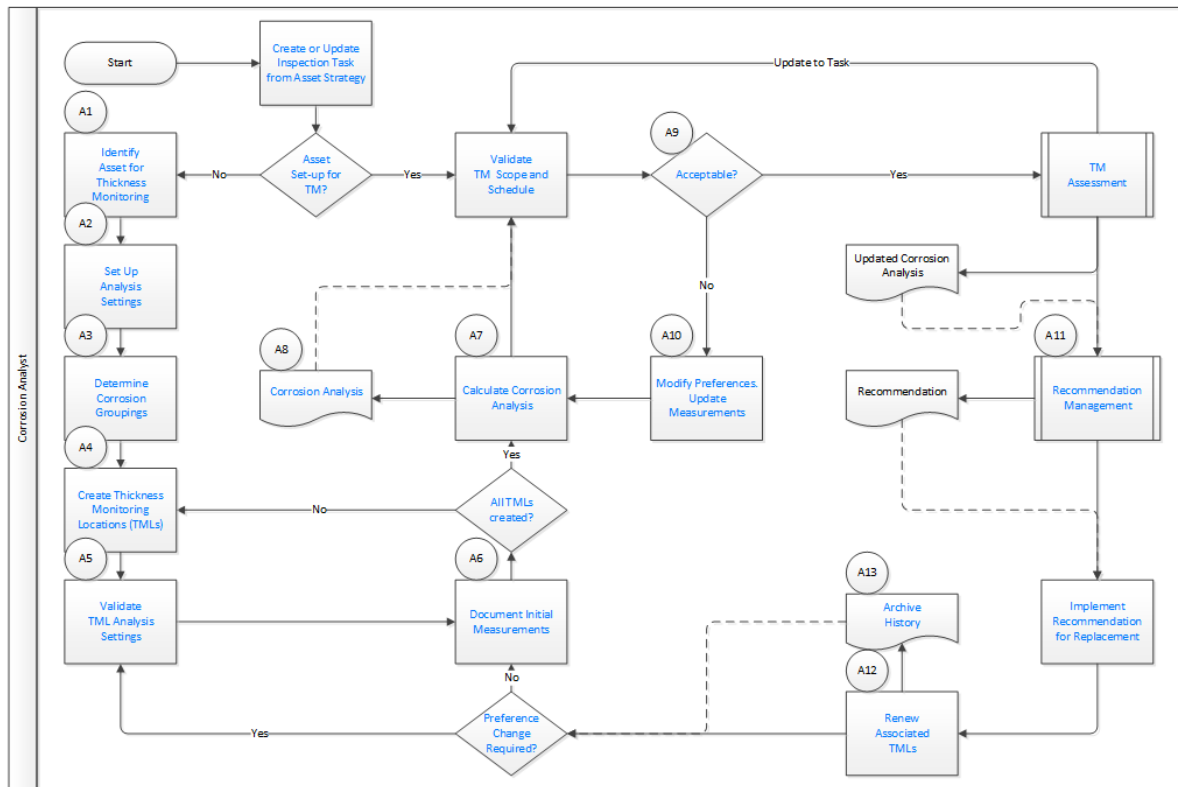
Create or Update Inspection Task from Asset Strategy

Persona: Analyst

The need for TM is defined as part of a well-developed Asset Strategy that mitigates risk of failure. TM typically mitigates the risk of loss of containment for stationary assets.

Asset Set-up for TM?

Persona: Analyst

The Analyst will be notified to set up the asset for TM.

If the asset is already set up for TM inspections, then validate the strategy recommended scope and schedule for TM inspection.

If the asset is not set up for TM inspections, then the additional information relative to the corrosive environments of the asset needs to be collected in order to determine TM inspection scope and schedule.

Identify Asset for Thickness Monitoring

Persona: Analyst

Starting at the asset level, defines all TM information.

Examples of assets in this context include stationary equipment such as piping, vessels, exchangers, tanks, and boilers.

Set Up Analysis Settings

Persona: Analyst

Define Corrosion Analysis preferences for each corrosion group.

These preferences establish how the corrosion rate will be calculated using standard Short Term, Long Term, and/or Least Squares methods. It also defines how that data is used to determine the Controlling Rate for the Corrosion Group and overall Asset.

In addition, a minimum task interval should be defined that is typically based on a risk-based strategy analysis or compliance to a regulatory code.

All of this information is used to determine the next inspection date from measurement readings taken in the field.

Determine Corrosion Groupings

Persona: Analyst

Define corrosion groups associated with the asset. Examples of this are:

- A heat exchanger subject to two different process streams on the shell and tube sides.
- A column that produces multiple distillate streams that may be subject to different corrosion environments.

In either case, the Corrosion Analyst may define corrosion groups with different analysis properties to assess the wall thicknesses of the affected asset components.

Create Thickness Measurement Locations (TMLs)

Persona: Analyst

Create TMLs, which are locations where TM data will be acquired in the field, trended, and analyzed.

TMLs are typically defined for each Corrosion Group.

TMLs are defined to adequately assess the wall thickness of the asset based on the asset configuration, corrosion group, and fluid stream properties.

All TMLs Created?

Persona: Analyst

Determine if all TMLs have been defined. After all TMLs are defined, initial readings and corrosion analysis will be conducted to determine the proper TM inspection task.

Validate TML Analysis Settings

Persona: Analyst

Assign each TML to a Corrosion Group, which will cause the TML to inherit that group's preferences. These preferences will be validated at the TML level, and will be adjusted as needed for the specific location.

Document Initial Measurements

Persona: Analyst

For new TMLs, document initial measurements to determine next inspection date and provide a baseline for future readings.

Calculate Corrosion Analysis

Persona: Analyst

Based on the initial readings, conduct a full corrosion analysis to determine the controlling corrosion rate, remaining life, and next inspection date.

Corrosion Analysis

Persona: Analyst

The result is a corrosion analysis summary by asset, a corrosion group, and an individual TML.

Validate Task Scope and Schedule

Persona: Analyst

The analysis will produce a Task scope and schedule for the next inspection date.

Validate that the scope defined by the analysis fully supports any existing asset strategy defined by risk analysis or code compliance.

Also, review the analysis results to ensure that it is based on good measurements and correct preference settings.

Acceptable?

Persona: Analyst

Based on the review of the analysis results in the previous step, determine if the analysis is acceptable.

Modify Preferences and Update Measurements

Persona: Analyst

If the results are not acceptable, then the Corrosion Analyst may elect to take some action to update the analysis to be more accurate.

This may include updating the preferences. For example, if the next inspection date does not support an existing risk-based asset strategy, the minimum interval preference may need to be updated.

This may also include updating measurements. For example, the accuracy of one measurement may be suspect. In this case, the Corrosion Analyst will acquire a new measurement reading to ensure that the analysis results are accurate.

TM Assessment

Persona: Analyst

If the analysis results are acceptable, then the Task is scheduled and will be executed as part of the Thickness Monitoring: Thickness Assessment workflow.

Go to the Thickness Assessment workflow.

Recommendation Management

Persona: Analyst

As a result of the TM Assessment, the Corrosion Analyst may recommend an asset or component replacement when it is determined that end of life is imminent or near term.

Go to the Manage Performance Recommendations workflow.

Implement Recommendation for Replacement

Persona: Analyst

Implement a recommendation for replacement of the asset or component. This recommendation will be managed through the Manage Performance Recommendations workflow and tracked through implementation.

Renew Associated TMLs

Persona: Analyst

Renew the TMLs associated with the replacement asset or component and initiate them for future TM inspections.

Archive History

Persona: Analyst

The prior TM measurement data is archived for historical purposes.

Preference Change Required?

Persona: Analyst

Determine if any preference change is required due to the new asset or component properties.

If a change is required, the TMLs will be updated with the change, and then the TM task validation process will be repeated.

If a change is not required, the TM task validation process will be repeated with the existing preferences defined for the previous TMLs.

Thickness Monitoring: Thickness Assessment Workflow

Thickness Monitoring: Thickness Assessment Workflow

The Thickness Assessment process includes complying with the execution of TM Tasks to acquire thickness measurements to evaluate asset integrity. A Technician will perform the inspections specified by the TM Tasks at the scheduled intervals. The Technician will typically use a data logger device to facilitate the field data collection.

In the following workflow diagram, the blue text in a shape indicates that a corresponding description has been provided in the sections that follow the diagram. For more information, refer to the topic Interpreting the Workflow Diagrams.
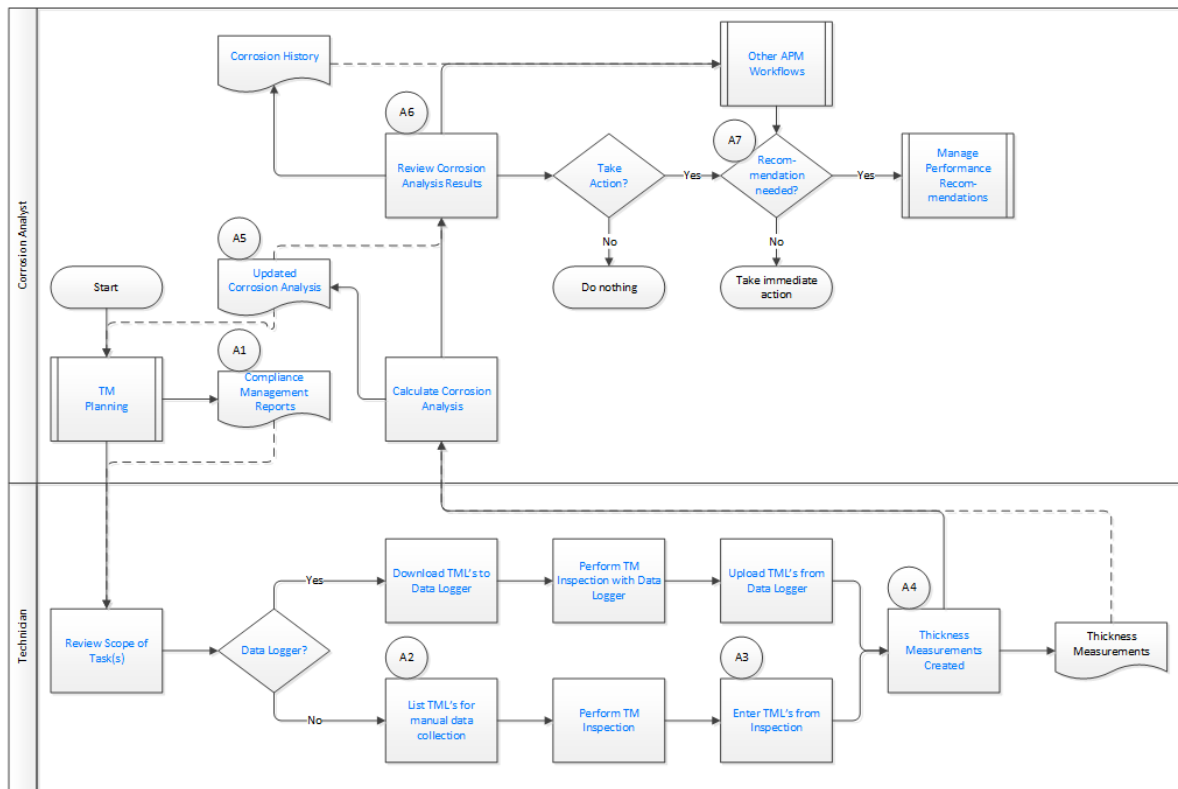
TM Planning

Persona: Analyst

TM Planning includes defining all of the elements required to implement and execute a comprehensive TM inspection plan. This includes identifying the relevant assets for TM and if they are subject to different corrosion environments.

For example, a heat exchanger is typically subject to two different process streams. One stream may be a fluid or gas with minimal corrosive properties, while the other may be a fluid or gas with highly corrosive properties. In this case, the Corrosion Analyst may define two corrosion groups with different analysis properties to assess wall thickness. Once the corrosion groups have been established, the Corrosion Analyst will identify the measurement locations needed to properly assess the current wall thickness and project remaining life.

Go to the TM Planning workflow.

Review Scope of Task(s)

Persona: Technician

For upcoming TM inspections, review the task scope to ensure that the proper thickness measurement method is used for the inspection.

Data Logger?

Persona: Technician

Information can be collected in the field either manually or using a data logger device. Determine if a data logger will be used for collection, and then proceed down the appropriate workflow path.

Download TMLs to Data Logger

Persona: Technician

If a data logger is used, download TMLs scheduled for inspection from the asset definition.

Perform TM Inspection with Data Logger

Persona: Technician

Using the data logger device, perform the TM inspection.

Upload TMLs from Data Logger

Persona: Technician

When all TMLs have been inspected, upload the measurements from the data logger device for review and analysis.

List TMLs for Manual Data Collection

Persona: Technician

If a data logger is not used, manually list the TMLs scheduled for inspection from the asset definition.

Perform TM Inspection

Persona: Technician

If a data logger is not used, use a measurement device and manually record measurements in the field at predefined locations.

Enter TMLs from Inspection

Persona: Technician

When all TMLs have been inspected, if a data logger has not been used, manually enter measurements for review and analysis.

Thickness Measurements Created

Persona: Technician

The result of executing TM inspections is new measurements for each TML for review and analysis.

Thickness Measurement

Persona: Technician

The result of executing a TM inspection is new measurements for each TML for review and analysis.

Calculate Corrosion Analysis

Persona: Analyst

Use the new measurements to perform a full corrosion analysis to determine the controlling corrosion rate, remaining life, and next inspection date.

Updated Corrosion Analysis

Persona: Analyst

The resultant corrosion analysis is created and the associated TM task is updated with the next inspection date.

Review Corrosion Analysis Results

Persona: Analyst

Review the results to determine if any follow-up action is necessary to ensure the integrity of the asset or improve asset performance.

Compliance Management Reports

Persona: Analyst

TM Inspection program compliance is an important part of the overall workflow.

Compliance Management Reports based on the defined TM Tasks provide a means to identify upcoming inspections so that they are scheduled and executed appropriately.

Take Action?

Persona: Analyst

Determine if a follow-up action is necessary. If it is, a proposal will be made by the analyst to business management. This could be a proposed change to an asset strategy, procedure, process, or policy.

Recommendation Needed?

Persona: Analyst

Determine if a recommendation is needed.

If a recommendation is not needed, the proposal requires immediate attention, and action is taken immediately.

If a recommendation is needed, the proposed change requires formal review and approval, as well as traceability through implementation. In this case, a recommendation will be created and managed forward.

Manage Performance Recommendations

Persona: Analyst

The new recommendation is managed for approval and implementation through the Manage Performance Recommendation workflow.

Go to the Manage Performance Recommendations workflow.

Corrosion History

Persona: Analyst

The overall result of TM inspections is to provide Corrosion History, which is used primarily for long-term strategy evaluation and development.

This corrosion history is can be evaluated through Core Analysis workflows or advanced strategy development methods, such as Risk Based Inspection (RBI).

Other Workflows

Persona: Analyst

For follow-up analysis, use Core Analysis.

Go to the Core Analysis: Asset Event Analysis workflow.

Go to the Core Analysis: Graph Analysis workflow>.

Go to the Core Analysis: Query Analysis workflow.

Go to the Core Analysis: Report Analysis workflow.

Chapter

3

Corrosion Analyses in Thickness Monitoring

Topics:

About Corrosion Analyses in Thickness Monitoring

A Thickness Monitoring Corrosion Analysis is a top-level summary of corrosion data for an asset, determined by calculations made using the values in Thickness Measurements linked to TMLs. Often, TMLs are linked in batches to TML Groups, which represent component parts of an asset.

Details

To conduct a Corrosion Analysis for an asset, you must:

- Identify an asset to analyze.
- Optionally, identify components of the asset you want to include as TML Groups.
- Organize equipment into TMLs.
- Collect measurement data for those TMLs.

You will complete these tasks by creating records, populating them with the appropriate information, and linking them together to establish relationships. As you complete these tasks, other records will be created to store calculations based upon the records that you created. Throughout this documentation, we refer to all these records and links collectively as a Corrosion Analysis.

About the Types of Corrosion Analyses

There are two kinds of Corrosion Analysis records:

- An Asset Corrosion Analysis, which is created and linked automatically to an asset when you first define Corrosion Analysis Settings for that asset.
- A TML Corrosion Analysis, which is created and linked automatically to a TML when the TML is first created.

The Asset Corrosion Analysis linked to an asset can be considered the top-level Corrosion Analysis, as it aggregates all data from the other Corrosion Analyses linked directly or indirectly to the asset.

Asset Corrosion Analyses

In addition to assets, Asset Corrosion Analyses are also created and linked automatically to any TML Group that is included in the Corrosion Analysis for an asset.

An Asset Corrosion Analysis represents a summary of the calculations that are stored in the TML Corrosion Analysis for each TML linked to a single asset or TML Group. Using an Asset Corrosion Analysis, you can determine the overall corrosion of an asset and make decisions about the actions that should be taken based upon the analysis results.

An Asset Corrosion Analysis represents:

- An Equipment record or TML Group.
- All the TMLs of a given TML Analysis Type (UT, RT, or TML) that are linked to the Equipment record or TML Group.
- All the Thickness Measurements that are linked to the TMLs.
- All the calculations that are performed based upon the values in the TMLs and Thickness Measurements.

Because baseline Thickness Monitoring supports the use of three TML Analysis Types (UT, RT, and TML), each Equipment record or TML Group can have up to three Asset Corrosion Analyses linked to it.

The TML Analysis Types UT and RT are provided for customers who want to classify TMLs according to measurement-collection method (ultrasonic thickness or radiographic thickness), and then perform calculations on each set of TMLs.

The TML Analysis Type TML is provided for customers who do not want to classify TMLs according to measurement-collection method, and instead prefer to analyze all TMLs together. Typically, you will use either both UT and RT, or only TML. Most customers will not use all three. Therefore, Equipment records and TML Groups will usually have either one or two Asset Corrosion Analyses linked to them.

TML Corrosion Analyses

Each TML Corrosion Analysis stores summary information and calculation results that are determined using the Thickness Measurements linked to TMLs.

When TMLs are linked to an asset or TML Group, the TML Corrosion Analyses linked to the TMLs will provide the information to the Asset Corrosion Analysis, which serves as an overview of the corrosion information gathered for each TML.

While the Asset Corrosion Analysis provides a useful summary of the corrosion status of a given asset, if you want to get a more detailed perspective of the corrosion of the equipment, you will need to examine the individual TML Corrosion Analyses. Because values in the Asset Corrosion Analysis are determined using values stored in individual TML Corrosion Analyses, you may need to review the TML Corrosion Analyses in order to interpret the data in a Corrosion Analysis Summary.

Equipment-Level Analysis Information

In most cases, the values stored in the Asset Corrosion Analysis represent calculations that are performed for TMLs using values in the TML Corrosion Analyses, which have been summarized based on settings defined for the analysis. For example, in the Corrosion Analysis Settings, you can specify whether you want the Asset Controlling Corrosion Rate to be the maximum corrosion rate for all TMLs, or an average of the corrosion rates that have been calculated for the TMLs. In other words, Asset Corrosion Analysis values are typically not unique to the Asset Corrosion Analysis itself.

In Corrosion Analyses that include both assets and TML Groups, the Asset Corrosion Analysis will contain information that is derived from the information stored in the Asset Corrosion Analyses for the assets and the TML Group.

For example, consider a piping circuit that contains three piping lines where the information for the piping circuit is stored in four records:

- Equipment A - Piping Circuit
- TML Group 1 - Piping Line 1
- TML Group 2 - Piping Line 2
- TML Group 3 - Piping Line 3

Additionally, assume that TMLs exist for each TML Group, and each of those TMLs has its own TML Corrosion Analysis. In this situation, each TML Group will have its own Asset Corrosion Analysis that stores summary information about the calculations stored in the corresponding TML Corrosion Analyses. The asset will also be linked to its own Asset Corrosion Analysis that stores summary information that is derived from the information in the analyses that are linked to each TML Group.

About Corrosion Analysis Settings

Corrosion Analysis Settings let you specify certain options that control how various values will be calculated in Asset and TML Corrosion Analyses. While Corrosion Analysis Settings exist as records, the settings should only be accessed and modified via Thickness Monitoring. Corrosion Analysis Settings are

used to calculate fields in Asset Corrosion Analyses. They are also used to populate fields in TMLs, and to determine values in the linked TML Corrosion Analyses. Some values can be defined at the asset or TML Group level, and then customized at the TML level. You will need to configure the Corrosion Analysis Settings based on the requirements of your organization. This will ensure that the analyses yield results that are useful and are meaningful to you and your organization. You can also select any custom corrosion rates that you defined via the TM Admin Preferences page.

For Assets and TML Groups

In a Corrosion Analysis that includes both an asset and TML Groups, Corrosion Analysis Settings must be defined for the asset and each TML Group. If you access an asset or TML Group in Thickness Monitoring that does not have Corrosion Analysis Settings defined, the Corrosion Analysis Settings workspace will be displayed automatically.

Different settings can be defined for each Inspection Type (UT, RT, and TML). When you create the Corrosion Analysis Settings for an asset or TML Group, you will need to choose the Inspection Type for which you want to configure settings. The Corrosion Analysis Settings that you create at the asset level can then be spread to the TML Group level (i.e., Corrosion Analysis Setting can be created and linked automatically to the TML Group) in the following scenarios:

- When you create a new TML Group for asset.
- When you define Corrosion Analysis Settings of a new Inspection Type for an asset. You can specify which existing TML Groups receive the new settings through the Select Spreading window.

The Corrosion Analysis Settings for a TML Group can also be accessed and modified individually.

Important: Analysis settings must be defined for asset and TML Group before you begin creating TMLs of a given TML Analysis Type and linking them to TML Groups.

For TMLs

On the TML level, the Corrosion Analysis Settings control how various values will be calculated in the TML Corrosion Analysis that is linked to a TML.

When you create a TML, Corrosion Analysis Settings are created and linked to it automatically. The Corrosion Analysis Settings for a TML are created using the settings defined for the asset or TML Group to which the TML is linked.

Most Corrosion Analysis Settings are defined at the asset or TML Group level. The following settings can be defined at the TML level:

- Allowable Measurement Variance
- Corrosion Rate Variance
- Default Inspection Interval
- Minimum Corrosion Rate
- Std Deviation Factor

After Corrosion Analysis Setting exist for a TML, you can modify the TML-specific settings via the Corrosion Analysis Settings workspace.

About Thickness Monitoring Tasks

Thickness Monitoring Tasks can be used to manage the inspection schedules for assets that you analyze in TM. Thickness Monitoring Task records will be created automatically when you create Corrosion Analysis Settings for an asset or TML Group. If you select the **Auto Manage Tasks** check box on the **TM Admin Preferences** page, when you update a TML, the corresponding Thickness Monitoring Task will be updated automatically.

The **Auto Manage Tasks** setting is disabled by default. If the Risk Based Inspection license is active, you should accept the default setting because you will use the Tasks generated from RBI, rather than TM, to determine your inspection intervals. If the Risk Based Inspection license is not active, you should enable the **Auto Manage Tasks** setting.

Note: Thickness Monitoring will create and update Thickness Monitoring Tasks automatically only if the Component ID setting is defined for the Equipment or TML Group family.

About Archived Asset Corrosion Analyses

When you archive an Asset Corrosion Analysis, you create a copy of the current, active Asset Corrosion Analysis and stores the data in a new, inactive Asset Corrosion Analysis.

Details

The value in the Analysis State field for the inactive Asset Corrosion Analysis is set to Archived. Additionally, Asset Corrosion Analyses:

- Are linked to the asset or TML Group through the Has Archived Corrosion Analyses relationship.
- Are linked to Corrosion Analysis Settings through the Has Archived Corrosion Analysis Settings relationship. When the Asset Corrosion Analysis is archived, a copy of the Corrosion Analysis Settings is also created and stored.

  Tip: When you review an archived Asset Corrosion Analysis, the archived Corrosion Analysis Settings are visible in the **Archived Corrosion Analyses** workspace.

- Are not linked to TMLs. TMLs and Thickness Measurements linked to those TMLs remain linked only to the active Asset Corrosion Analysis.

Archived Asset Corrosion Analyses are meant to serve as a historical record of the conditions that existed at the time the Asset Corrosion Analysis was archived. Archiving an Asset Corrosion Analysis can be useful if you want to:

- Create a snapshot of the Asset Corrosion Analysis based on certain Corrosion Analysis Settings, and then modify the settings to see how they affect the calculations.
- Create a copy of the existing Asset Corrosion Analysis before making changes to the related TMLs or Thickness Measurements, such as adding or excluding TMLs.

Each asset and TML Group can have multiple archived analyses. You can archive the current, active Asset Corrosion Analysis as many times as needed.

Note: When you archive an Asset Corrosion Analysis, the Asset Corrosion Analyses for TML Groups linked to the asset will also be archived.

About Bulk Analysis

Bulk Analysis allows you to use a single action to update calculations for all or selected assets, as well as all TMLs and TML Groups linked to those assets.

Bulk Analyze

4 of 4 Assets Calculated

100%

Done

Asset ID	Date	Calculation Status
D0002-097 ~ 000000000001056783 ~ VESSEL - REGENERATOR ~ Miscellaneous Vessel ~ FIX VES MIS	Tuesday,May 02,2017 17:02 PM	✓Successful
D0003-097 ~ 000000000001056788 ~ VESSEL - MAIN COLUMN TOWER ~ Miscellaneous Vessel ~ FIX VES MIS	Tuesday,May 02,2017 17:02 PM	✓Successful
D0001A-097 ~ 000000000001056782 ~ VESSEL - REACTOR TOWER STRIPPER ~ Reactor ~ FIX VES REA	Tuesday,May 02,2017 17:02 PM	✓Successful

Calculation Details

Tuesday,May 02,2017 17:02 PM:
Asset ID: D0002-097 ~ 000000000001056783 ~ VESSEL - REGENERATOR ~ Miscellaneous Vessel ~ FIX VES MIS
Calculation Completed Successfully.

[View Complete Log] [Close]

When you calculate a bulk analysis, you:

- Calculate an analysis for each selected asset, as well as TML Groups and TMLs linked to the selected asset.
- Print or save a log of all the calculated analyses.

About the Remaining Life Graph

The data on the Remaining Life graph represents how long after the current day an asset or TML Group can be in service, based on the T-Min value and the current rate of corrosion.

Details

When you access the Remaining Life graph, the results of the analysis performed on a specific asset or component are displayed in sections. By default, the sections are ranges of years:

- 0 - 5
- 6 - 10
- 11 - 25
- > 25

The size of a section is determined by the number of TMLs that have a Remaining Life that fall in the range of the section.

On the Remaining Life graph, you can:

- View a list of TMLs for a range, along with their remaining life values and the IDs of the associated assets, by selecting the section on the graph.
- Clear the filter by selecting **Clear Filter**.
- Filter the data based on the analysis type by selecting the appropriate value in the **Analysis Type** box.

Create Corrosion Analysis Settings

About This Task

Before an asset can be accessed via the **Thickness Monitoring Overview** page, you must create Corrosion Analysis Settings for that asset.

Procedure

1. On the top navigation bar, select ⏶ .
   The **Asset Hierarchy** page appears.
2. On the **Asset Hierarchy** page, select the asset for which you want to create corrosion analysis settings.
3. In the workspace, select the **Integrity** tab, and then, in the **Thickness Monitoring** row, select **TML Groups**.

   Note: TML Groups will only appear if you have selected an asset. If you have selected a functional location, **Assets** replaces **TML Groups**.

   The **TM** page appears, displaying the **Corrosion Analysis Settings** workspace.

By default, values in the following boxes are populated automatically as follows:

- The **Inspection Type** box is set to UT.
- The **Controlling Corrosion Rate** box is set to Maximum.
- The **Std Deviation Factor**, **Remaining Life Critical Number of TMLs**, **Minimum Corrosion Rate**, and **Remaining Life Factor** boxes are populated with values.
- The **Short Term**, **Long Term**, **Factor Remaining Life**, and **Inspection Interval** check boxes are selected.

Tip: If needed, you can modify values in the available fields.

4. Select **Create Settings**.
   The Corrosion Analysis Settings record is created.

Next Steps

Access a TML.

Access the Analysis Overview Workspace

Before You Begin

Create Corrosion Analysis Settings.

Procedure

1. Access the **Thickness Monitoring Overview** page for the Functional Location that contains the asset, TML Group, or TML whose **Analysis Overview** workspace you want to access.

2. In the workspace, select the **Assets** tab.
   The **Assets** section appears, displaying a list of assets with Corrosion Analysis Settings that are contained in the Functional Location.

3. In the row containing the asset whose **Analysis Overview** workspace you want to access, select the link.
   The **Analysis Overview** workspace for the asset appears.

Tip: To access or modify the datasheet for the selected asset or TML Group, in the workspace, select the **Details** tab.

If you want to access the Analysis Overview for a:

- TML Group, proceed to the next step.
- TML, proceed to step 5.

4. In the left pane, select a TML Group.
   The **Analysis Overview** workspace for the TML Group appears.

5. To access the **Analysis Overview** workspace for a TML, complete the following steps:

   a) In the left pane, select a TML.
      The **Measurements** section for the TML appears.

   b) Select the **Analysis Output** tab.
      The **Analysis Overview** workspace for the TML appears.

Analysis Overview
~ ~ AQA Test TML Plot

TMLGRP-64263607863 -

TML 1 UT Active

TML 1 UT Active

| Analysis Output | Trends | Measurements | TML Details |

Summary   Details

Controlling Corrosion Rate (Short Term, Long Term):	9.9959 Mils/year
Long Term Corrosion Rate:	9.9959 Mils/year
Short Term Corrosion Rate:	9.9959 Mils/year
Least Squares Corrosion Rate:	9.9959 Mils/year
Scheduled Next Inspection Date:	12/1/2018
Interval Next Inspection Date:	3/1/2022
Factor Remaining Life Date:	12/1/2018
Projected T-Min Date:	9/1/2025
T-Min Value:	0.015 Inches
Estimated Remaining Life From Today:	5 Years, 11 Months, 30 Days
Maximum Allowable Working Pressure:	---
Maximum Historical Corrosion Rate:	9.9959 Mils/year
Allowable Measurement Variance Applied:	No
Calculated Date:	8/29/2019 1:48 AM

Tip:

- To access or modify the datasheet of the selected TML, in the workspace, select the **TML Details** tab.
- To access or modify the datasheet of the selected asset or TML Group, in the workspace, select the **Details** tab.
- To access the Asset Corrosion Analysis or the TML Analysis datasheet for the selected asset, TML Group, or TML, select the **Details** tab within the **Analysis Output** section.

Results

From the **Analysis Overview** workspace for an asset or TML Group, you can also:

- Access the Remaining Life graph.
- Access linked TMLs.
- Access the datasheet for the selected asset or TML Group, or the Asset Corrosion Analysis.

From the **Analysis Overview** workspace for a TML, you can also:

- Access the Trends graph.
- Access linked measurements.
- Access the datasheet for the selected TML, or the TML Corrosion Analysis.

From the **Analysis Overview** workspace, in the **Analysis Output** section, you can also access a summary of the Asset Corrosion Analysis or the TML Corrosion Analysis for the selected asset, TML Group, or TML.

Access the Remaining Life Graph

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the **Remaining Life** graph that you want to access.
2. In the workspace, select the **Remaining Life** tab.
   The **Remaining Life** section appears, displaying the following information:
   - **The remaining life graph:** Displays a pie chart of the remaining life (in years) of the TMLs linked to the selected asset or TML Group.
   - **The remaining life table:** Displays a list of TMLs, along with their remaining life values and the IDs of the associated assets. This list is filtered based on your selection on the graph. If you want to view a list of all the TMLs in the TML Group or Asset, then select **Clear Filter**.
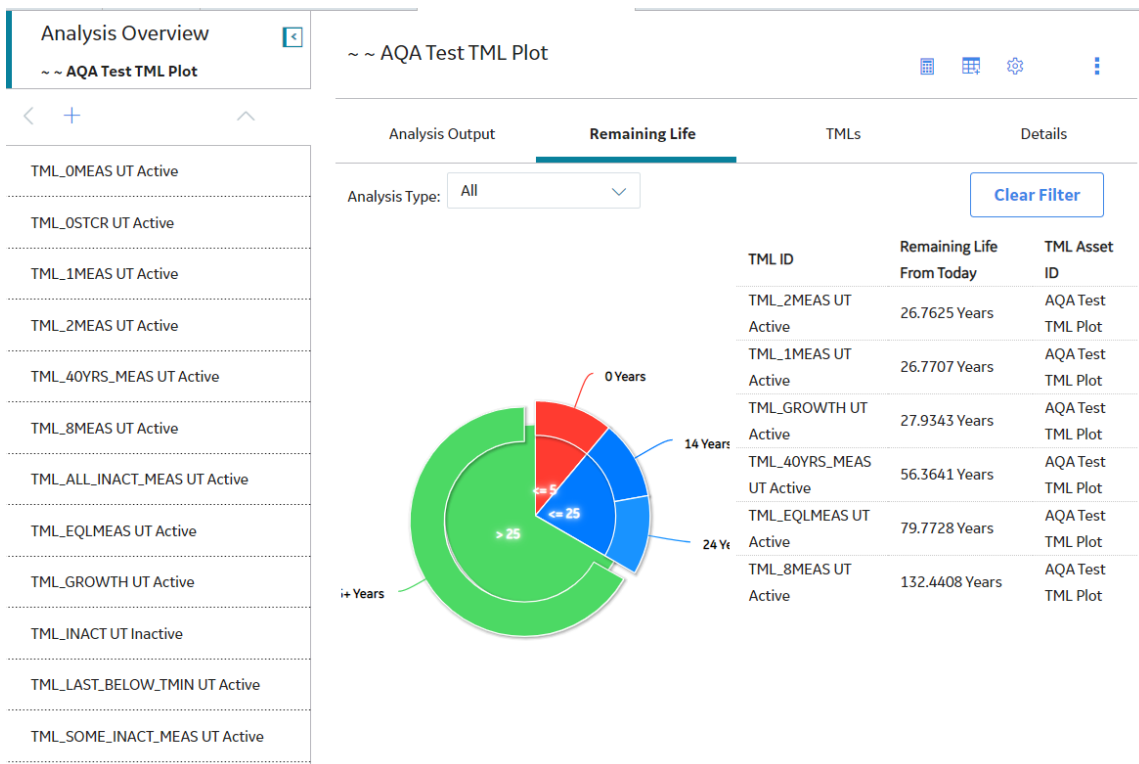
Tip: By default, the graph is plotted for TMLs associated with all analysis types. You can, however, filter the graph by selecting an analysis type in the **Analysis Type** box.

Modify Corrosion Analysis Settings

Before You Begin

Create Corrosion Analysis Settings.
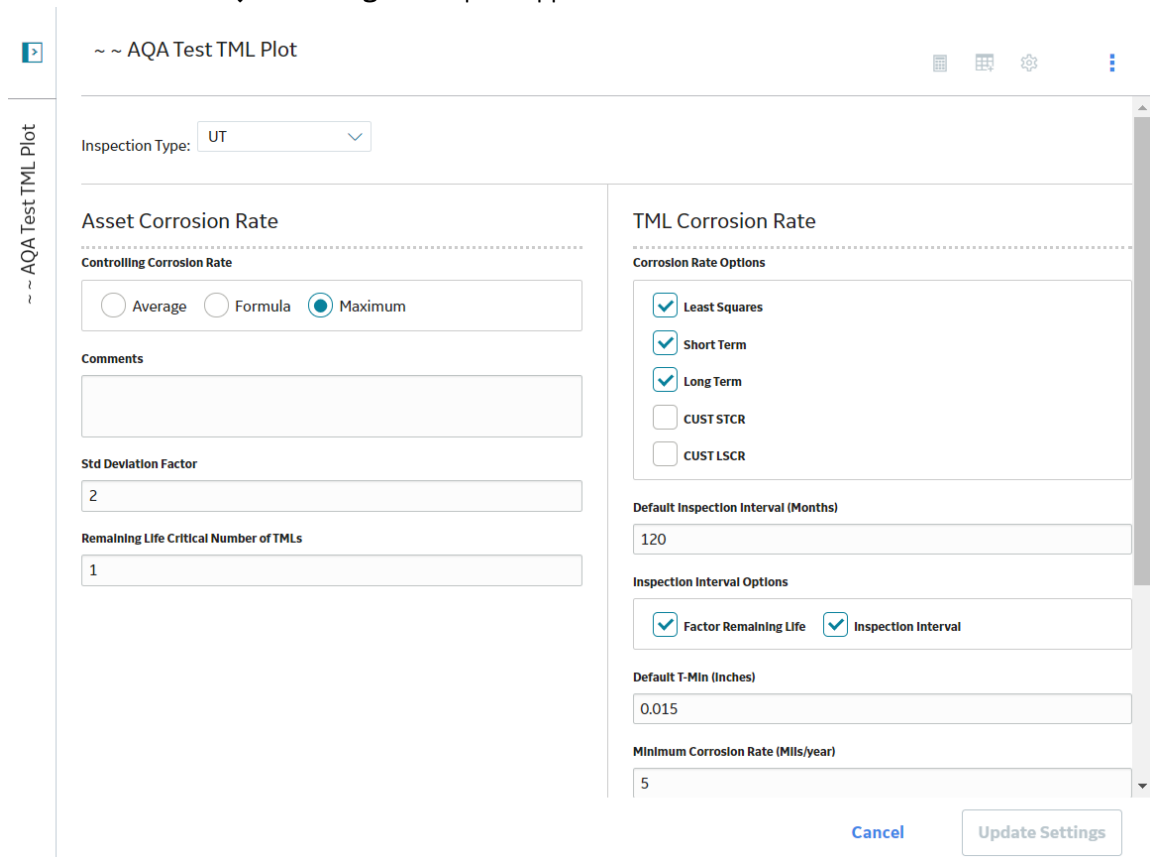
About This Task

If you modify the settings for an asset, you can apply the modified settings to the associated TML Groups and TMLs as well.

After modifying the corrosion analysis settings, the analysis will be recalculated.

Procedure

1. Access the **Analysis Overview** workspace for the asset, TML Group, or TML whose corrosion analysis settings you want to modify.

2. In the upper-right corner of the workspace, select ⚙.
   The **Corrosion Analysis Settings** workspace appears.

3. Modify the settings as needed.

4. Select **Update Settings** or **Create Settings**.

   Note: The **Create Settings** button appears only if you have selected an Inspection Type for the analysis that does not yet exist for the selected record.

   A message appears, indicating that the settings have been updated successfully. In addition:

   • If you selected a TML, the analysis is recalculated using the new settings. If so, skip to step 10.
   • If you selected an asset that is not linked to TML Groups or TMLs, the analysis is recalculated using the new settings. If so, skip to step 10.
   • If you selected an asset or TML Group that is linked to TMLs that have settings, the Select Dependencies to Update window appears, displaying a list of those TMLs. If so, skip to step 8.
   • If you selected an asset that is linked to TML Groups with settings of the same Inspection Type as the asset, the **Select Dependencies to Update** window appears. If so, skip to step 6.

- If the selected asset is linked to TML Groups that do not have settings of the same Inspection Type as the asset, the **Select Spreading** window appears. By default, all rows in the list are selected. If so, proceed to the next step.

5. In the **Select Spreading** window, in the list, clear the rows that correspond to the TML Groups for which you do not want to create settings of the same Inspection Type.

Select Spreading of RT Corrosion Analysis Settings

Select the row(s) for the subcomponents you wish to add this setting to:

F0065-097-1 - HEAD
F0065-097-2 - NOZZLE
F0065-097-3 - SHELL

[Select All] [Clear All] [Done] [Cancel]

6. Select **Done**.
   The settings for the selected TMLs are saved. In addition:

   - If there are no additional TMLs linked to the selected asset that share the same Inspection Type as the asset, the procedure is complete. If so, skip to step 10.
   - If there are additional TML Groups that are linked to the asset that share the same Inspection Type as the asset, the **Select Dependencies to Update** window appears. If so, proceed to the next step.

7. In the **Select Dependencies to Update** window, in the list, select the check boxes that correspond to the TML Groups whose settings you want to update.

Select Dependencies of F0065-097 ~ 000000000001057047 ~ VESSEL - ACCUMULATOR (WAS 2112...

	Type	Asset ID	Default Inspection Interval	
☐	RT	F0065-097 ~ 000000000001057047 ~ VESSEL - ACCUMULATOR (WAS 2112F0006) ~ Drum ~ FIX BOI DRU	180 Months	3300536
☐	RT	F0065-097-1 - HEAD	180 Months	3300536
☐	RT	F0065-097-2 - NOZZLE	180 Months	3300538
☐	RT	F0065-097-3 - SHELL	0	3300540

[Cancel] [Next]

8. Select **Next**.
   A new window appears, displaying a list of TMLs. By default, the check boxes for all TMLs are selected.

Select Dependencies of F0065-097 ~ 000000000001057047 ~ VESSEL - ACCUMULATOR (WAS 2112...

	Type	Asset ID	TML ID	Default Inspection Interval	
☑	RT	F0065-097 ~ 000000000001057047 ~ VESSEL - ACCUMULATOR (WAS 2112F0006) ~ Drum ~ FIX BOI DRU	180 Months		3300536

Cancel   **Finish**

9. In the list, clear the check boxes corresponding to each TML whose settings you do not want to update.

   Note: Only the settings that were changed in step 2 will be updated.

10. Select **Finish**.
    A message appears, indicating that the settings for the selected asset or TML Group and all selected dependent settings have been updated successfully. Then, the analysis is recalculated.

11. To return to the **Analysis Overview** workspace, select **Cancel**.

Calculate a Corrosion Analysis

Before You Begin

- Create Corrosion Analysis Settings.
- Create a Thickness Measurement Location (TML).
- Add a Thickness Measurement.

Procedure

1. Access the **Analysis Overview** workspace for the asset, TML Group, or TML whose analysis you want to calculate.

2. In the upper-right corner of the workspace, select ⊞ .

   Note: If the button is an orange ⊞ , data has changed since the last calculation, and the analysis needs to be recalculated.

   The analysis is calculated.

Results

- The Calculated Date field on the Asset Corrosion Analysis or the TML Corrosion Analysis datasheet is updated with the current date. Any other analysis data that changes will also be updated on the datasheet.

Perform a Bulk Analysis

About This Task

When you perform a bulk analysis, the following analyses will be updated:

- Asset Corrosion Analyses for all or selected assets.

- Asset Corrosion Analyses for TML Groups that are linked to all or selected assets.
- TML Corrosion Analyses for TMLs that are linked to the assets and TML Groups.

Procedure

1. Access the **Thickness Monitoring Overview** page.
2. Select the **Assets** tab or the **Assets Requiring a Calculation** tab.
   The corresponding section appears.
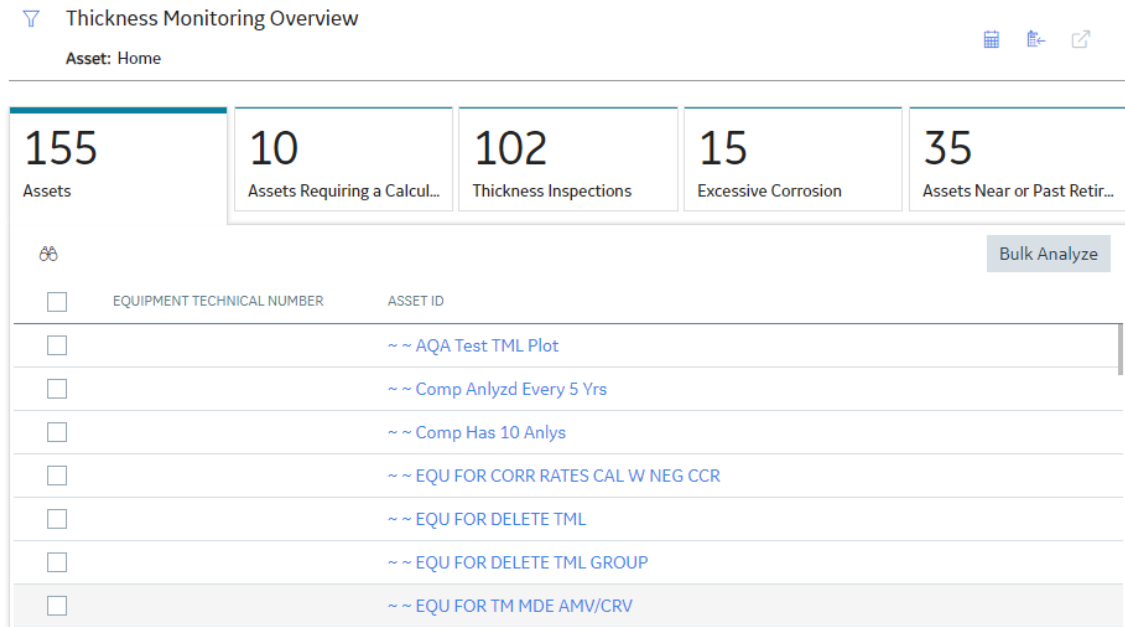
3. If you want to analyze all the assets in the list, select **Bulk Analyze** in the upper-right corner of the section.
   -or-

   If you want to analyze a subset of the available assets, then select the check box for each asset that you want to analyze, and then select **Bulk Analyze** in the upper-right corner of the section.

   A message appears, asking you to confirm that you want to validate and analyze those assets that require calculation.
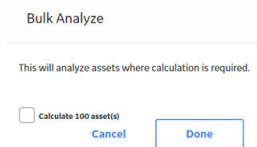
4. Select **Done**.

   Note: The assets that required calculation are calculated while those that have been previously calculated are skipped. If, however, you select the **Calculate 100 assets** check box, all the selected assets are calculated regardless of their previous calculation status.

   The **Bulk Analyze** window appears, displaying the calculation progress and a log detailing any errors. If the calculation fails, a list of the required fields appears in an error report at the bottom of the **Bulk Analyze** window.
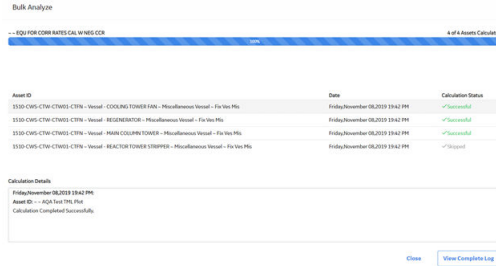
5. After the calculation is complete:

   - To view the log details for all calculated analyses, select **View Complete Log**.
   - To view the log details for a single analysis, in the list, select that analysis.
   - To close the window, select **Close**.

   Note: If the calculation is still in progress, a message appears, stating that the calculation continues even after you close the **Bulk Analyze** window. If the calculation is complete, then the window closes, and the lists of assets in the **Assets** and **Assets Requiring a Calculation** sections on the **Thickness Monitoring Overview** page are updated.

Archive an Asset Corrosion Analysis

Before You Begin

When you archive an Asset Corrosion Analysis, the Asset Corrosion Analyses for TML Groups linked to the asset will also be archived.

Procedure

1. Access the **Analysis Overview** workspace for the asset that contains the Asset Corrosion Analysis that you want to archive.

   Note: Asset Corrosion Analyses can only be archived on the asset level.

2. In the upper right corner of the workspace, select ⋮ , and then select **Archive Analyses**.

   A message appears, asking you to confirm that you want to archive the selected Asset Corrosion Analysis.

Results

- You can now review the archived analyses.

Review Archived Analyses

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the archived Asset Corrosion Analysis that you want to review.

2. In the upper-right corner of the workspace, select ⋮ , and then select **Review Archived Analyses**. The **Archived Corrosion Analyses** workspace appears.

Tip: Archived Asset Corrosion Analyses can only be reviewed at the selected level. For example, if you select an asset, you cannot review the archived Asset Corrosion Analysis for a linked TML Group.

Reset Maximum Historical Corrosion Rate (MHCR)

About This Task

When you reset the Maximum Historical Corrosion Rate (MHCR) for:

- An Asset Corrosion Analysis, the Maximum Historical Corrosion Rate in the analysis is replaced with the Controlling Corrosion Rate.
- A TML Corrosion Analysis, the Maximum Historical Corrosion Rate in the analysis is populated with the value in the Corrosion Rate field.

Procedure

1. Access the **Analysis Overview** workspace for the asset, TML Group, or TML for which you want to reset MHCR.

2. In the workspace heading, select ⋮ , and then select **Reset MCHR**.

   The **Confirm MHCR Reset** dialog box appears, asking you to confirm that you want to reset the MHCR.

   Note: If the TML Group for which you want to reset the MHCR has analyses of different inspection types, the **Reset MHCR** window appears. Next to the Inspection Types that you want to reset, select the check boxes.

3. Select **Yes**.

   The MHCR is reset.

Results

- The corrosion analysis for which you reset MHCR needs to be recalculated.

Chapter

4

TMLs

Topics:

About Thickness Measurement Locations (TMLs)

A TML is a specific location on an asset where Thickness Measurement readings are taken and for which various values, including minimum thickness, are calculated. Each asset or TML Group can have multiple TMLs associated with it, which stores identifying information. Thickness Measurements are linked to TMLs, which store readings taken at that location.

About Renewing Thickness Measurement Locations (TMLs)

Renewing TMLs provides a mechanism for optionally recording a new base measurement for a TML and setting all existing Thickness Measurements to Inactive. Additionally, the value that was the Controlling Corrosion Rate for the TML prior to the renewal replaces the Minimum Corrosion Rate value in the associated Corrosion Analysis Settings after the renewal. You can renew Thickness Measurement Locations without adding new measurements.

Details

Generally, you will want to renew TMLs when you replace an asset. For example, if an asset representing a tank is linked to one or more TMLs that have Thickness Measurements, when you replace the tank, you can renew the TMLs to retain the measurement data recorded for the old tank while creating a new base measurement for the new tank. When you do this, you can begin calculating Corrosion Analyses for the new tank.

When you renew a TML:

- In linked Thickness Measurements, if the Measurement Status Indicator field was set to Active prior to the renewal, it will be set to Inactive.
- The value in the Historical Sequence Number field in linked Thickness Measurements that were used during that life cycle will be incremented. For example, if the Historical Sequence Number field previously contained no value, indicating that the associated TML had never been renewed, it will now be 1, indicating that the associated Thickness Measurement Location record has been renewed one time.
- The value in the Renew Historical Sequence Number field of the TML will be populated with the largest Historical Sequence Number in the associated Thickness Measurements that were used during that life cycle. For example, assume there are two associated Thickness Measurements that were used during the life cycle. If the Historical Sequence Number of the first measurement is 1 and that of the second measurement is 2, the Renew Historical Sequence Number field in the TML is populated with the value 2. This will keep track of the life cycle for that TML.
- The value in the Minimum Corrosion Rate field in the Corrosion Analysis Settings for the TML is replaced with the current value in the Controlling Corrosion Rate field in the TML.
- The value in the Status Changed By field in the TML will update to reflect the User ID of the Security User who renewed the TML.
- The value in the Status Changed Date field in the TML will change to the current date.

About Moving Thickness Measurement Locations (TMLs)

Under some circumstances, it may be necessary to move TMLs from one asset or TML Group to another. There are two scenarios in which you might perform this task.

Moving TMLs from one Corrosion Analysis to another

You may determine that a TML that was originally linked to one asset or TML Group actually belongs to a different asset or TML Group that is included in a different Corrosion Analysis. In this case, rather than creating a new TML for the correct asset or TML Group, you can relocate the TML.

In this case, you will use Relocate TMLs to select the TML that you want to move and the asset or TML Group to which it will be linked.

Moving TMLs from one TML Group to another in the same Corrosion Analysis

You may determine that a particular subset of existing TMLs actually belong in their own TML Group. If so, you would create a TML Group for the asset, and then move the TMLs to the new TML Group.

In this case, you will use Organize TMLs to move the TMLs from one TML Group to another.

Details

When you move a TML from one asset or TML Group to another:

- The TML ID of the TML you want to relocate cannot be the same as that of a TML that is already linked to the target asset or TML Group.
- The TML that you relocate will now be linked only to the target asset or TML Group that you select via the Has Datapoints relationship.
- The value in the TML Asset ID field of any relocated TML will be updated to reflect the target asset or TML Group.
- Any Thickness Measurements, TML Corrosion Analyses, and Corrosion Analysis Settings that are linked to a TML will remain linked after the TML is relocated.
- The Corrosion Analysis Settings for the relocated TML will inherit the values in the Corrosion Analysis Settings that are linked to the target asset or TML Group, with the exception of the following fields:
  - Allowable Measured Variance
  - Corrosion Rate Variance
  - Default Inspection Interval
  - Minimum CR
- You can select TMLs from multiple source assets or TML Groups for a single relocate operation, but you can select only a single target. If you want to relocate TMLs to more than one target asset or TML Group, you will need to perform the relocate procedure multiple times.
- After the TMLs are relocated, all calculations will be updated for the Corrosion Analysis that is associated with the source and target asset or TML Groups.

Access a Thickness Measurement Location (TML)

About This Task

This topic describes how to access a TML via the **Analysis Overview** workspace for an asset or TML Group. You can also access the **Analysis Overview** workspace directly for a TML.

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TML that you want to access.
2. In the workspace, select the **TMLs** tab.

    The **TMLs** section appears, displaying the following information:

- If you selected an asset, a list of TMLs linked to the asset appears. This list includes TMLs linked to TML Groups or subcomponents linked to the selected asset.
- If you selected a TML Group, a list of TMLs linked to the TML Group appears.
- The color-coding categories appear at the top of the section. The number in parentheses next to each category indicates the number of TMLs in each category.
- The visual cue that appears in each row indicates the color-coding category that is applicable to the TML.

Tip: In the **TMLs** section, you can:

- Select a color-coding category to filter the list of TMLs in that category. For example, if you select **Below T-Min**, the TMLs that meet the criterion for Below T-Min appear. You can remove the filter by selecting the same category again.

- Delete a TML by selecting ▯ .

3. In the row containing the TML that you want to access, select the link.
The **Analysis Output** section appears, displaying a summary of the associated TML Corrosion Analysis.

| Analysis Overview | TML1 UT Active | | | |
| ~ ~ RBI EQU NONINTR REQ MET | | | | |

TML1 UT Active

| Analysis Output | Trends | Measurements | TML Details |

| Summary | Details |

Controlling Corrosion Rate (Short Term, Long Term):	19.2035 Mils/year
Long Term Corrosion Rate:	19.2035 Mils/year
Short Term Corrosion Rate:	19.2035 Mils/year
Scheduled Next Inspection Date:	3/17/2010
Interval Next Inspection Date:	3/17/2010
Factor Remaining Life Date:	6/1/2010
Projected T-Min Date:	8/16/2015
T-Min Value:	0 Inches
Estimated Remaining Life From Today:	0 Days
Maximum Allowable Working Pressure:	---
Maximum Historical Corrosion Rate:	19.2035 Mils/year
Allowable Measurement Variance Applied:	No
Calculated Date:	7/1/2016 5:48 PM

4. If you want to access the TML datasheet, select the **TML Details** tab.
   The **TML Details** section appears, displaying the TML datasheet.

Tip: If needed, modify values in the available fields, and then select 🖫 to save your changes.

Create a Thickness Measurement Location (TML)

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group for which you want to create a new TML.

2. In the left pane, select ＋, and then select **TML**.

   The **Create TML** window appears.

3. In the **TML ID** box, enter a unique TML ID.
4. In the **Analysis Type** box, select the type of analysis that you want to create.

   If you have defined additional required fields for TMLs, proceed to the next step. Otherwise, skip to step 7.
5. Select **Next**.

   The TML datasheet appears.
6. As needed, enter values in the available fields.
7. Select **Done**.

   The new TML is created, and the **TML Overview** workspace appears.

Results

- The new TML is linked to the record selected in step 1.
- TML Corrosion Analysis Settings are created automatically for the new TML. The values in the TML Analysis Settings are inherited from the analysis settings for the asset or TML Group selected in step 1.
- You can modify the TML by accessing the datasheet.

Configure the Thickness Monitoring Location (TML) Section

About This Task

You can configure the table in the **TMLs** section by adding or removing fields using the **Choose Columns** window.

Note: The **Choose Columns** window displays all the fields from the TML Corrosion Analysis and Thickness Monitoring Location families except for the TML ID field. The table in the **TMLs** section displays the default column configuration for first-time users. You can access the **Choose Columns** window to add or remove columns from the table. You can also arrange the columns in the table. Any changes made to the columns in the table in the **TMLs** section of the **Analysis Overview** page are saved to the GE Digital APM database for GE Digital APM users.

Procedure

1. Access the **Analysis Overview** workspace containing the **TMLs** section that you want to configure.
2. In the **Analysis Overview** workspace, select the **TMLs** tab.
   The **TMLs** section appears.

3. In the **TMLs** section, select 🗂.
   The **Choose Columns** window appears.

4. In the **Choose Columns** window, in the **Available Fields** section, select the fields you want to appear in the table, and then select ⟩ .

   Tip: To remove a field from the table, in the **Choose Columns** window, in the **Display Fields** section, select the field you want to remove from the table, and then select ⟨ .

5. Optionally, to reorder the fields in the **Display Fields** section, select ⌃ ⌄

6. Select **OK**.
   The selected fields appear in the **TMLs** section.

Results

- The TML table configuration is saved as a user preference in the GE Digital APM database.

- The fields added via the **Choose Columns** window also appear in the following areas:
  - The Renew TMLs window
  - The Exclude TMLs window
  - The Organize TMLs window
  - The Relocate TMLs workspace

Copy Thickness Measurement Locations (TMLs)

Procedure

1. Access the TML that you want to copy.

2. In the upper-right corner of the page, select ⋮ , and then select **Copy TML**.
   The **Copy TML** window appears.

   Copy TML

   Number of Copies

   1

   TML ID

   TML ID

   Cancel   OK

3. Complete the required fields:
   - In the **Number of Copies** box, use the arrows to indicate how many copies of the selected TML you want to create.
   - In the **TML ID** field, enter a unique name for the copied TML
   - **Important:** You cannot update the **TML ID** field if are copying more than one TML. If you copy multiple TMLs, this field will be populated automatically.
4. Select **OK**.
   The **Analysis Overview** workspace appears, and the newly copied TMLs appear in the left pane.
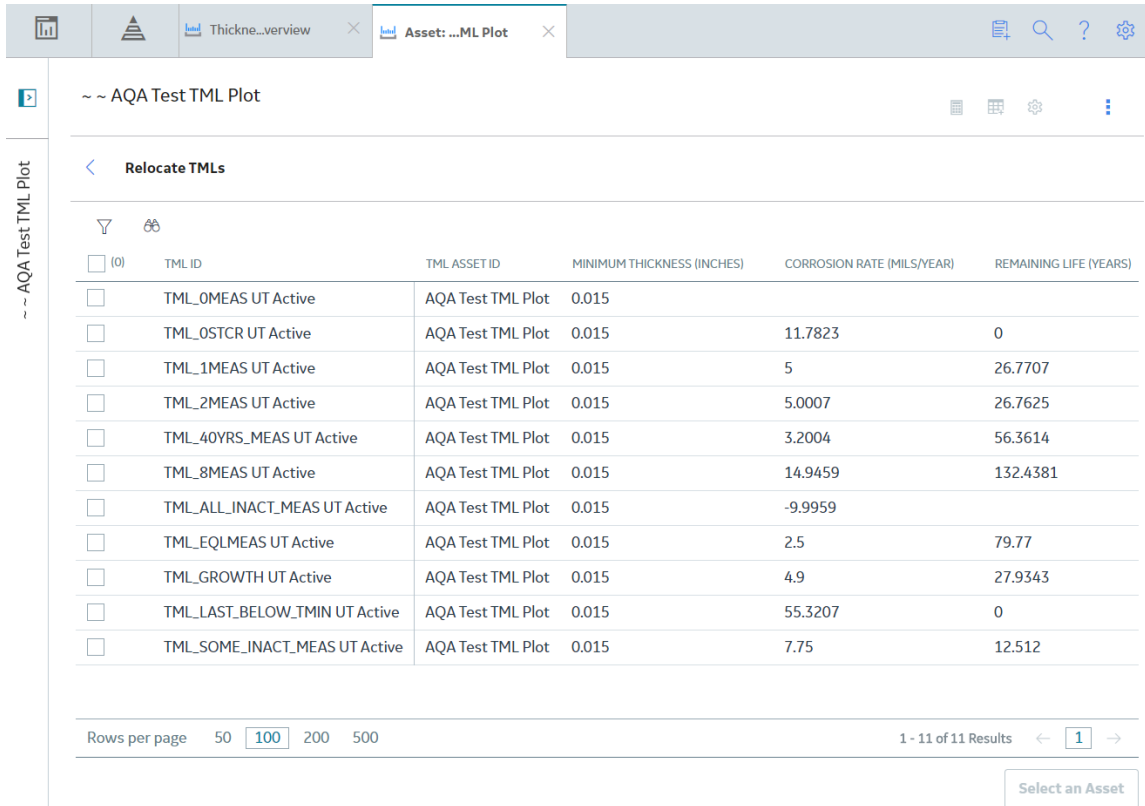
Relocate a Thickness Measurement Location (TML)

About This Task

You can relocate TMLs to move TMLs from a source asset or TML Group to a different target asset, or to a TML Group or subcomponent linked to that target asset. If you need to move TMLs to or between subcomponents linked to the same asset, use the Organize TMLs method.

Procedure

1. Access the **Analysis Overview** workspace for the asset the TMLs you want to relocate.

2. Select ⋮ , and then select **Relocate TMLs**.
   The **Relocate TMLs** workspace appears.

3. In the list, select the check boxes corresponding to the TMLs that you want to relocate.

   Note: If you do not see the TMLs that you expect, or want to limit the list, in the upper-left corner of the workspace, confirm the setting in the **Analysis Type** list, and whether the **Active TMLs Only** check box is selected.

4. Select **Select an Asset**.
   The **Select Target** window appears.

Select Target

Hierarchy	Available Subcomponents	Selected Item

Search... 🔍

▽ Filter

▼ Home

    00 ~

  ▸ 00000-
HealthAutomatedTestRoo
t ~ TestFL20200307_09:50

    0001-010-RF-01 ~

  ▸ 0001-010-RF-01 ~ RFID
enabled Packaging Line 10

    00-B ~

    00-B01 ~

    00-B01-1 ~

    00-B01-1A ~

    00-B01-1B ~

Cancel   Done
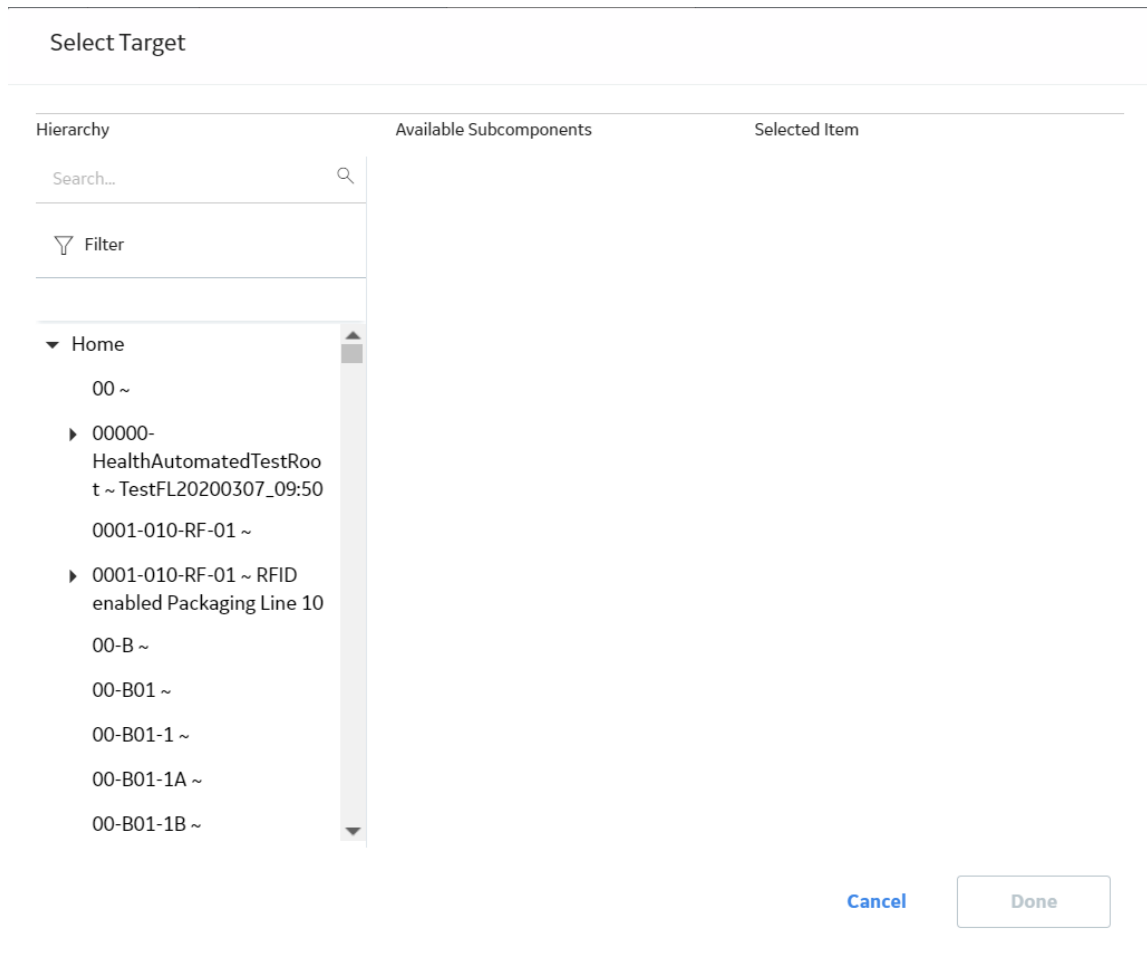
5. In the Asset Hierarchy, navigate to the asset to which you want to relocate the TMLs.
   In the **Selected Item** box, the Asset ID for the asset appears. In the **Available Subcomponents** box, a list of linked subcomponents appears.
6. If you want to relocate the TMLs to a subcomponent, such as a TML Group, in the **Available Subcomponents** box, select the subcomponent to which you want to relocate the TMLs.
7. Select **Done**.
   The TMLs are relocated to the selected asset or subcomponent.

Results

The analyses of the affected assets and subcomponents are recalculated.

Renew Thickness Measurement Locations (TMLs)

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TMLs that you want to renew.
2. Select ⋮ , and then select **Renew TMLs**.
   The **Renew TMLs** window appears, displaying a list of the TMLs linked to the asset or TML group.

Renew TMLs

	TML ID	TML Asset ID	Minimum Thickness (Inches)	Corrosion Rate (Mils/year)
☐	0001-001-01 Test1~00001 UT Active	0001-001-01 Test1	0.12	5
☐	0001-001-01 Test1~00002 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00003 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00004 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00005 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00006 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00007 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00008 UT Active	0001-001-01 Test1	0.12	10.0068
☐	0001-001-01 Test1~00009 UT Active	0001-001-01 Test1	0.12	10.0068

3. Select the check boxes corresponding to the TMLs that you want to renew.

   Note: If you do not see the TMLs that you expect, or want to filter the list, verify the filter settings. You can configure to view only the active TMLs and filter the list based on the analysis type.

4. Select **Renew TMLs**.
   The renewal of TMLs starts and the renewal progress appears in the upper-right corner of the **Renew TMLs** window.

Tip: The renewal process continues even if you close the **Renew TMLs** window. You can view the progress of the job from the Schedule Logs. In case any TML fails to renew, the job is placed in the **Failed** section of the **Schedule Logs** page.

Organize Thickness Measurement Locations (TMLs)

About This Task

You can organize TMLs to move TMLs to or between TML Groups and subcomponents associated with the same asset. If you want to move TMLs to another asset, or to a subcomponent of that asset, you should relocate those TMLs.

Procedure

1. Access the **Analysis Overview** workspace for the TML Group or subcomponent to which you want to move TMLs.

2. In the upper-right corner of the workspace, select ⋮ , and then select **Organize TMLs**.
   The **Organize TMLs** workspace appears, displaying a list of TMLs linked to the asset to which the TML Group or subcomponent you selected in step 1 is linked. This list includes TMLs linked to all TML Groups and subcomponents that the asset contains, including the one that you selected in step 1.

Note: If you do not see the TMLs that you expect, or want to limit the list, in the upper-left corner of the workspace, confirm the setting in the **Analysis Type** list, and whether the **Active TMLs Only** check box is selected.

3. Select the check boxes corresponding to the TMLs that you want to move to the TML Group or subcomponent.

4. Select **Move**.
   The selected TMLs are moved to the TML Group or subcomponent, and the corrosion analysis is recalculated.

Exclude a Thickness Monitoring Location (TML)

Before You Begin

- Only MI Thickness Monitoring Administrator and members of the MI Thickness Monitoring Inspector Security Group can exclude TMLs from an analysis.

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TMLs that you want to exclude.

2. In the workspace, select the **TMLs** tab.
   A list of TMLs contained in the analysis appears in the workspace.

Analysis Overview		~ ~ AQA Test TML Plot			

Analysis Overview
~ ~ AQA Test TML Plot

~ ~ AQA Test TML Plot

TMLGRP-64263112476 -			
TMLGRP-64263131884 -			
11 UT Active			
TML_0STCR UT Active			
TML_1MEAS UT Active			
TML_2MEAS UT Active			
TML_40YRS_MEAS UT Active			
TML_8MEAS UT Active			
TML_ALL_INACT_MEAS UT Active			
TML_EQLMEAS UT Active			
TML_GROWTH UT Active			

Analysis Output   Remaining Life   TMLs   Details

Summary   Details

Analysis Type: UT

Calculated Date:	10/14/2019 12:58 AM	
Controlling Corrosion Rate (Maximum):	4.2653 Mils/year	Based on: TML_0STCR UT Active
Scheduled Next Inspection:	9/24/2029	Based on: TML_0STCR UT Active
Projected T-Min Date:	9/11/2039	Based on: TML_0STCR UT Active
Estimated Remaining Life From Today:	19 Years, 10 Months, 27 Days	
Maximum Allowable Working Pressure:	---	
Maximum Historical Corrosion Rate:	55.3207 Mils/year	
TMLs Below T-Min:	0	TMLs: None

3. In the upper-right corner of the workspace, select ⋮ , and then select **Exclude TMLs**.
The **Exclude TMLs** window appears, providing a list of TMLs in the analysis. If a TML has already been excluded, the corresponding check box is selected.

Exclude TMLs

	TML ID	TML Asset ID	Minimum Thickness (Inches)	Corrosion Rate (Mils/year)
☐	TML_0MEAS UT Active	AQA Test TML Plot	0.015	
☐	TML_0STCR UT Active	AQA Test TML Plot	0.015	4.2653
☐	TML_1MEAS UT Active	AQA Test TML Plot	0.015	5
☐	TML_2MEAS UT Active	AQA Test TML Plot	0.015	5.0007
☐	TML_40YRS_MEAS UT Active	AQA Test TML Plot	0.015	3.2004
☐	TML_8MEAS UT Active	AQA Test TML Plot	0.015	14.9459
☐	TML_ALL_INACT_MEAS UT Active	AQA Test TML Plot	0.015	
☐	TML_EQLMEAS UT Active	AQA Test TML Plot	0.015	2.5
☐	TML_GROWTH UT Active	AQA Test TML Plot	0.015	4.9

1 - 11   of 11 record(s)

Cancel   **Done**

4. In the list, select the check boxes corresponding to the TMLs that you want to exclude.

   Note: If you do not see the TMLs that you expect, or want to limit the list, in the upper-left corner of the window, confirm the setting in the **Analysis Type** box, and whether the **Active TMLs Only** check box is selected.

5. Select **Done**.
   The selected TMLs are excluded from the analysis.

   Tip: At this time, you can calculate the Analysis with the newly excluded TMLs by selecting ⊞ .

Access the TM Quick View Page

About This Task

The **TM Quick View** page displays a list of TMLs in an asset or TML Group, along with details on the corrosion rate, next inspection date, measurements taken in each month, and so on.

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group whose TMLs you want to view.

2. Select ⋮ , and then select **Quick View**.
   The **TM Quick View** page appears.

Note: The unit of measure displayed on the grid is based on your selections on the **Units of Measure and Conversion Set** page.

The **TM Quick View** page displays the following information:

- From the Thickness Measurement Location family:

  ◦ Minimum Thickness
  ◦ TML Analysis Type
  ◦ TML Asset ID
  ◦ TML ID

    Tip: You can select the link in the **TML ID** column to access the **Analysis Overview** page corresponding to a TML.

- From the TML Corrosion Analysis family:

  ◦ Corrosion Rate
  ◦ Projected T-Min Date
  ◦ Scheduled Next Inspection Date

- From the Thickness Measurement family:

  ◦ <Month><Year>: Contains a list of measurements for the month and year displayed in the column heading, separated by a semicolon.

Note: By default, the **TM Quick View** page displays measurements taken in the past ten years. If you want to modify the data range, in the upper-left corner of the page, select ▽

Modify TMLs in Bulk

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that you want to modify.

2. In the workspace, select the **TMLs** tab.
The **TMLs** section appears.

3. Next to each TML that you want to modify, select the check box, and then, in the upper-right corner of the section, select **Edit in Bulk**.
The **Bulk Edit TMLs** window appears, displaying the selected TMLs.

Tip: The Bulk Edit TMLs window displays 50 TMLs per page.

Bulk Edit TMLs

Datasheet ID:

TML Bulk Edit

	TML ID - Value(s)	Number of Readings...	Minimum Thickness ...	Component Type - V...	Design Code - Val...
✓	001-Shell Course 1	1	0.625 (Inches)	---	⌄
✓	002-Shell Course 1	1	0.625 (Inches)	---	⌄
✓	003-Shell Course 2	1	0.625 (Inches)	---	⌄
✓	004-Shell Course 2	1	0.625 (Inches)	---	⌄
✓	005-Shell Course 3	1	0.625 (Inches)	---	⌄

Save   Close

4. As needed, on the **Bulk Edit TMLs** window, modify the fields.
5. Select **Save**, and then select **Close**.
   The selected TMLs are modified.

   Tip: The TMLs you selected appear in the TML Bulk Edit datasheet.

Access the Trends Graph

About This Task

Note: If you are a member of the MI TM Viewer Security Group, or if you are assigned the MI Mechanical Integrity Viewer Security Role, then you cannot access the Trend Graph.

Procedure

1. Access the TML whose Trends graph you want to access.
2. In the workspace, select the **Trends** tab.
   The **Trends** section appears, displaying the Trends graph.
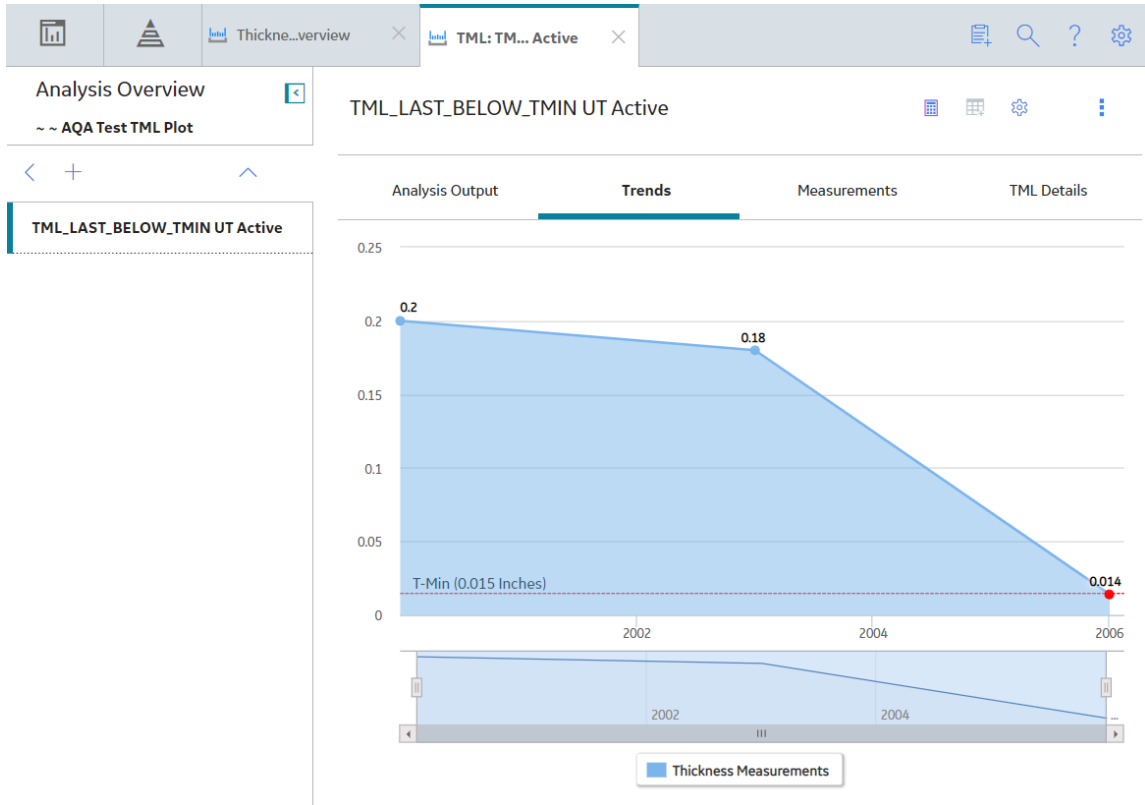
By default, the Trends graph displays data based on the thickness measurements and Controlling Corrosion Rate for the TML.

3. At the bottom of the section, select:
   - **Thickness Measurements** to view or hide plotted points based on the values of linked Thickness Measurements.
   - **Controlling CR** to view or hide trend lines based on the Controlling Corrosion Rate.
   - **LSCR**, **STCR**, or **LTCR** to view or hide trend lines based on the Least Squares, Short Term, or Long Term Corrosion Rates.

   Note: At most, two of the three options, **LSCR**, **STCR**, or **LTCR**, will be available at any given time. The third one is represented by **Controlling CR**. The options are visible if the corresponding corrosion rates exist.

Define Allowable Stress

About This Task

This topic describes how to define the Allowable Stress value for a TML manually. You can also have GE Digital APM populate the value based on values in a few fields in the TML record. This procedure can be performed before or after you have automatically calculated Allowable Stress for a TML.

Note: Refer to the Allowable Stress reference tables and the method of interpolation used in Thickness Monitoring.

Procedure

1. Access the TML for which you want to define Allowable Stress.

2. In the workspace, select the **TML Details** tab.
   The **TML Details** section appears, displaying the **General Information** subsection.

3. Select the **Design General** tab.
   The **Design General** subsection appears.
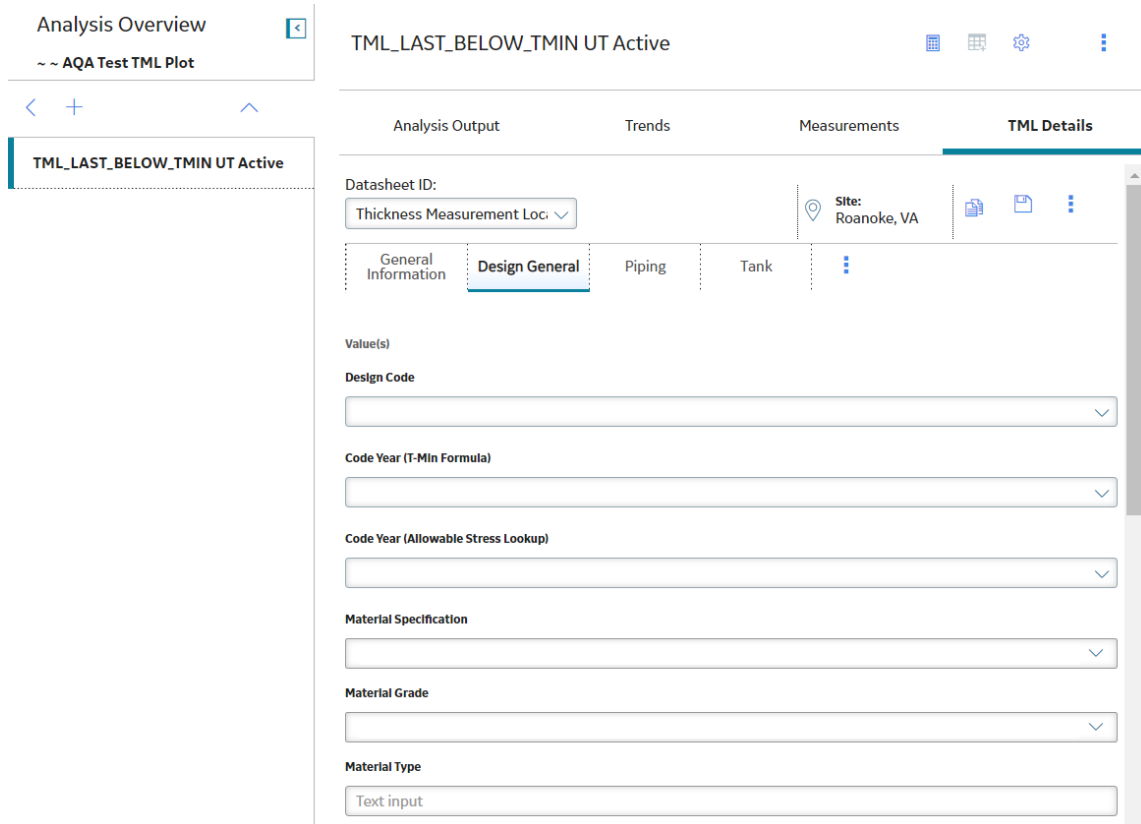
4. Select the **Override Allowable Stress** check box.
   The **Allowable Stress** box is enabled.

5. Enter a value in the **Allowable Stress** box.

6. In the upper-right corner of the section, select ⧉.
   The Allowable Stress value is saved.

Calculate Allowable Stress

About This Task

This topic describes how to have GE Digital APM calculate the value in the Allowable Stress field automatically. You can also define a value manually.

Note: Refer to the Allowable Stress reference tables and the method of interpolation> used in Thickness Monitoring.

Procedure

1. Access the TML for which you want to define Allowable Stress.
2. In the workspace, select the **TML Details** tab.
   The **TML Details** section appears, displaying the **General Information** subsection.
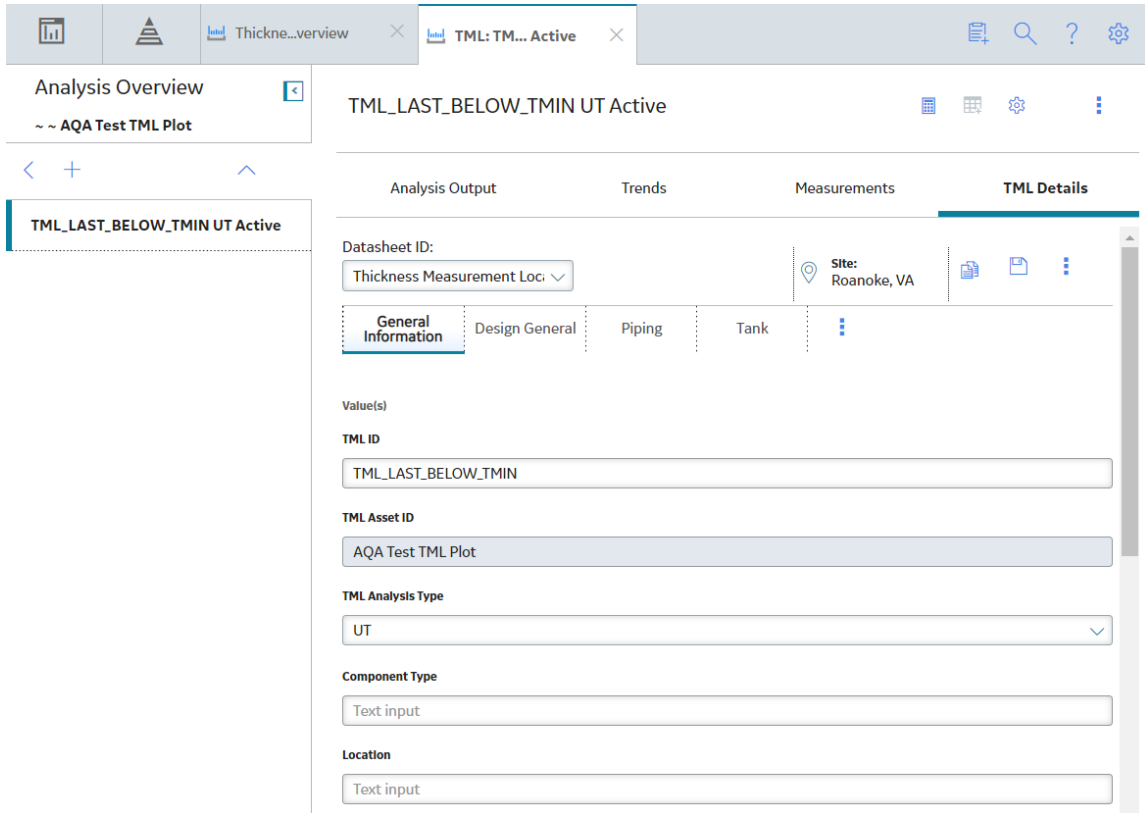
3. Depending on the type of equipment the TML represents (i.e., the component type), enter values in the required fields.

For Piping and Pressure Vessels, enter values in the following fields:

- **Code Year (Allowable Stress Lookup)**
- **Design Code**
- **Material Grade**
- **Material Specification**
- **Design Temperature**

For Tanks of the type Welded Shell, enter values in the following fields:

- **Code Year** (Allowable Stress Lookup)
- **Design Code**
- **Tank Type**
- **Material Grade**
- **Material Specification**
- **Design Temperature**

For Tanks of the type Annular Ring, enter values in the following fields:

- Nominal Diameter
- Maximum Operating Fill Height
- Plate Thickness

The Allowable Stress field is populated with a value based on the component type.

4. In the upper-right corner of the section, select 🖫.
The Allowable Stress value is saved.

Make a Thickness Measurement Location (TML) Inactive

Before You Begin

- When you make a Thickness Measurement Location (TML) inactive, it will be excluded from any future corrosion analysis calculations.

Procedure

1. Access the TML that you want to make Inactive.
2. In the workspace, select the **TML Details** tab.
   The **TML Details** section appears, displaying the **General Information** subsection.
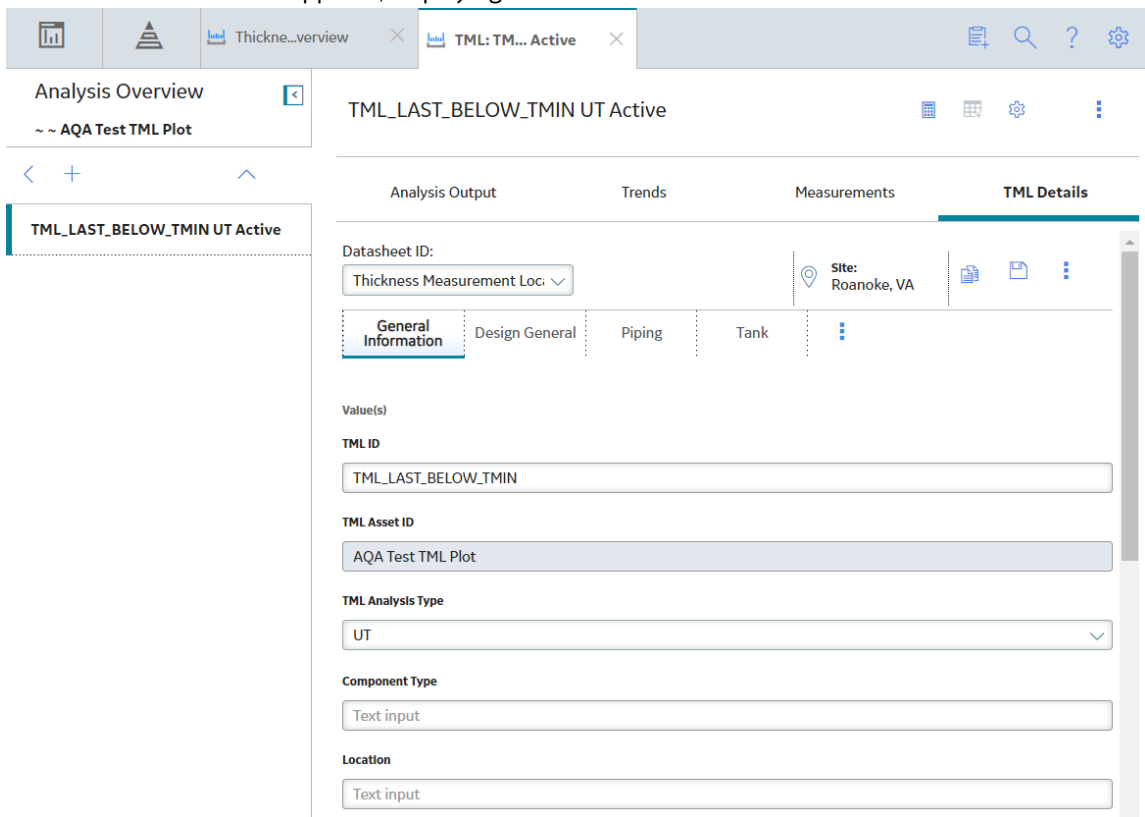
3. In the **Status Indicator** box, select **Inactive**, and then select **Save**.
   The TML is now inactive.

Delete a Thickness Measurement Location (TML)

Before You Begin

- When you delete a TML, any linked measurements, Corrosion Analysis Settings, and TM Corrosion Analyses are also deleted.

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Procedure

1. Access the TML that you want to delete.

2. Select ⋮ , and then select **Delete**.

   A message appears, asking you to confirm that you want to delete the TML and any linked Thickness Measurements.

3. Select **Yes**.

   The TML is deleted.

Chapter

5

TML Groups

Topics:

About TML Groups

A TML Group is a group of TMLs that represent a component of an asset.

Details

Suppose you have an asset, Piping Circuit 101,) which contains three components, Line A, Line B, and Line C. On those components, there are multiple TMLs. The following image illustrates this example, where the components are represented by shaded regions, and the TMLs are represented by stars.
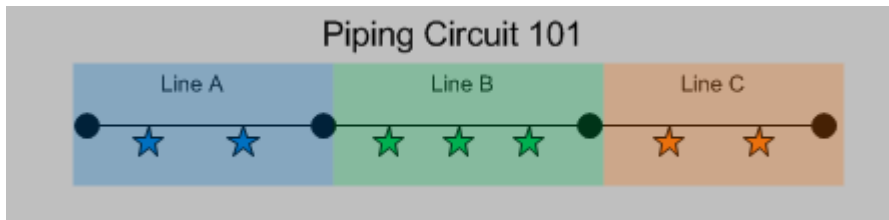
For a given asset, a TML Group can represent:

- **All TMLs that exist on that asset.** You would create a TML Group to represent all TMLs that exist on an entire asset if the asset is a standalone asset. You would create one TML Group to represent all of the stars.

- **A subset of TMLs that exist on one or more components that belong to the asset**. Using this option, you could create:

  ◦ One TML Group per component, where the TML Group represents all TMLs that exist on that component. You would create three TML Groups, one to represent each set of stars.
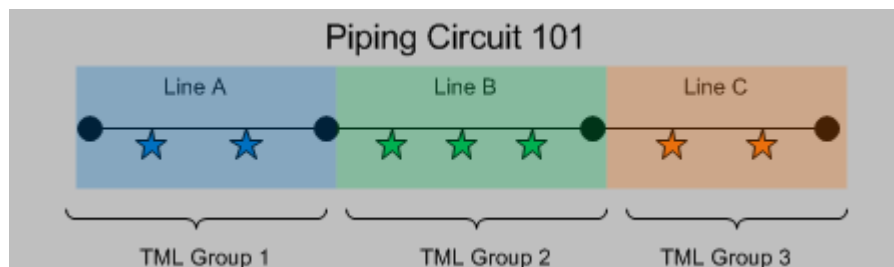
  -or-

  ◦ **One TML Group for multiple components, where the TML Group represents all TMLs that exist on those components**. Using the previous Piping Circuit 101 example, you could create two TML Groups, where one represents the blue and green stars and one represents the orange stars.

Piping Circuit 101
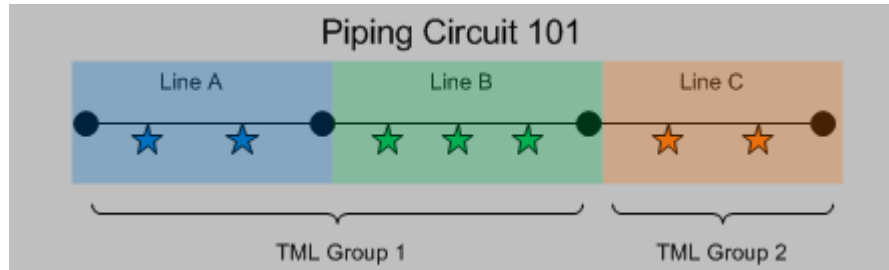
Additionally, throughout the life of the asset, you might identify one or more TMLs within a TML Group that you want to analyze separately from other TMLs. In this case, you can create additional TML Groups to represent any subdivision of an existing group of TMLs.

For example, suppose that an asset that you are analyzing in Thickness Monitoring represents a shell and tube heat exchanger. The shell and tube heat exchanger has two components, the shell side and the tube side, each with its own process flow. Since the corrosion environments of these components will differ, you might create the following TML Groups:

- TML Group - Shell Side
- TML Group - Tube Side

When you first begin analysis on the shell and tube heat exchanger, you are not sure what the TM corrosion data will show, (i.e., whether TML Group - Shell Side or TML Group - Tube Side will have more aggressive corrosion). After you have completed some analysis on the shell and tube heat exchanger, you notice that a subset of TMLs on the shell side near the nozzle have very high corrosion rates. At this point, you create a third TML Group, TML Group - Shell Nozzle to represent this component, and you move the TMLs associated with this component from TML Group - Shell Side to TML Group - Shell Nozzle.

Regardless of what they represent, all TML Groups in a Corrosion Analysis will be linked directly to a single asset. If you decide to use TML Groups, all TMLs in your Corrosion Analysis should be linked directly to TML Groups (rather than the asset to which the TML Groups are linked).

About Equipment and TML Groups

Each Corrosion Analysis begins with an asset for which you want to monitor corrosion. The asset you want to monitor may consist of a number of components you want to monitor independently. If so, you can create a TML Group for each component to contain the TMLs that are for that specific component.

Details

Before you can conduct a Corrosion Analysis on an asset, an Equipment record must exist in the GE Digital APM database to represent the asset on which you want to perform the corrosion analysis. The types of records that you create in your Corrosion Analyses will depend upon what your Equipment records represent.

Before you can create TML Groups, an Asset Corrosion Analysis and Corrosion Analysis Settings must be created for an asset, represented by an Equipment record. Equipment records can be created manually via Record Manager, or they may be loaded into your database from another data source (e.g., SAP). After assets exist, you can create TML Groups.

Example: Using Piping Circuits to define TML Groups

Consider, for example, a piping circuit that contains three piping lines. You might want:

- One Equipment record to store all of the information for the piping circuit and the three piping lines.
  -or-

- One Equipment record to store information for the piping circuit and three TML Groups to store information for the individual piping lines (one TML Group for each piping line). These TML Groups would be linked directly to the Equipment record that stores information for the piping circuit.

About Corrosion Analyses that Include TML Groups

You should include TML Groups in your Corrosion Analyses if any of the assets that you will analyze in TM consist of components that you want to analyze individually, or you want to analyze corrosion data for certain groups of TMLs on an asset or component. What the TML Groups that you create represent will depend upon whether the associated Equipment record represents a standalone asset or an asset that contains components.

If you use this method:

- You must configure preferences for the Equipment family.
- Each TML Group that you create will be linked to an Equipment record representing the asset through the Has TML Group relationship.
- An Asset Corrosion Analysis and Corrosion Analysis Settings will be created and linked to the Equipment record representing the asset, as well as each TML Group that is linked to that asset.
- All TMLs that you create will be linked directly to a TML Group. In this case, TMLs should not be linked directly to the asset.

Details

The following diagram illustrates the structure of Corrosion Analyses that include TML Groups. Specifically, this diagram illustrates the records and links that would exist if a Corrosion Analysis included one Equipment record (representing an asset), which is linked to three TML Groups. The boxes in the diagram are labeled according to the records that they represent, and the lines connecting the boxes represent the links between these records in a Corrosion Analysis.
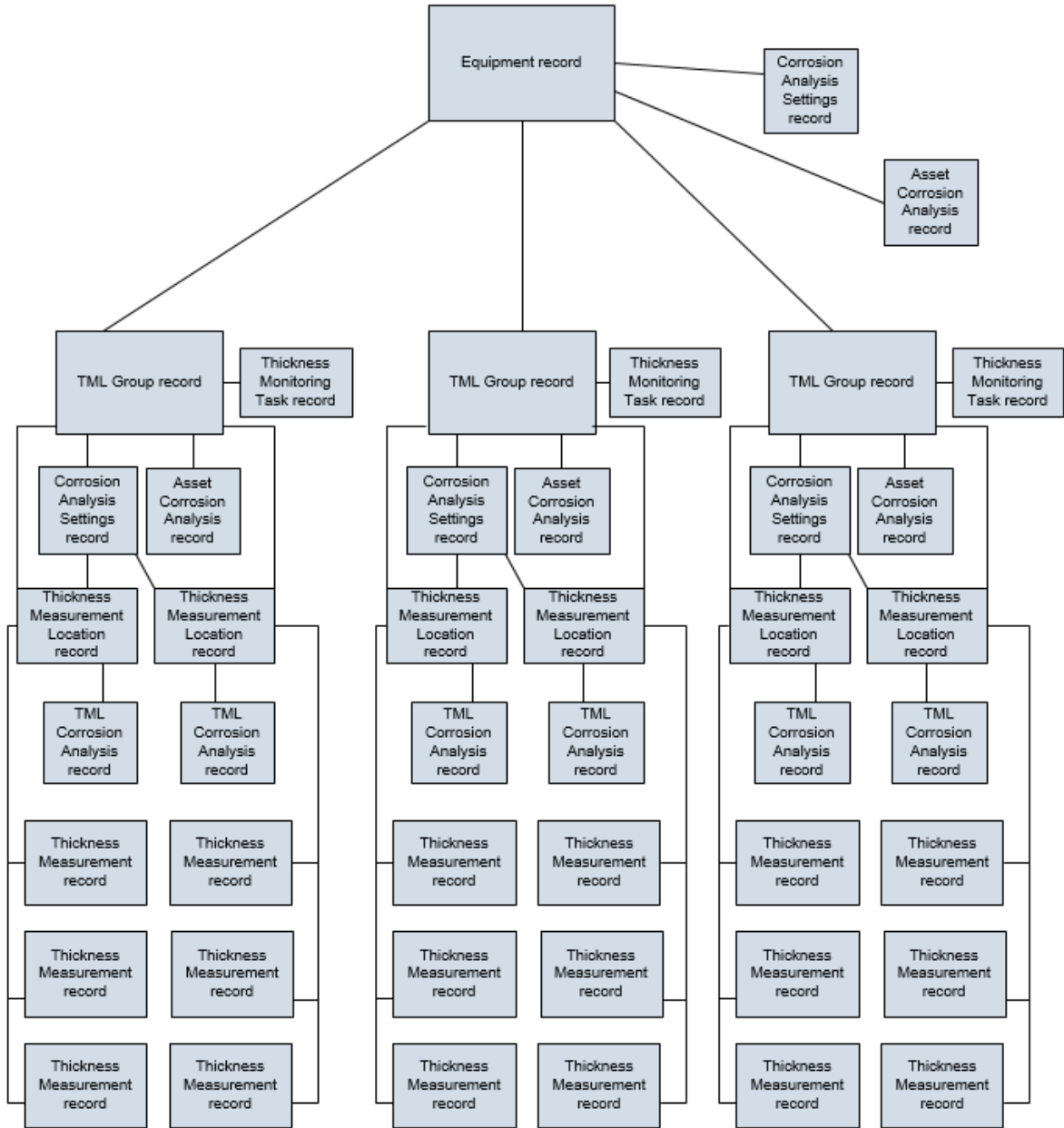
The following table provides information on how the records that are illustrated in the diagram are created manually or automatically.

Record	Notes
Corrosion Analysis Settings	Manually for Equipment records -and- Automatically for TML Groups that you create and link to those equipment records.
Asset Corrosion Analysis	Automatically for Equipment records and TML Groups, but at different points in the workflow.
Equipment	Manually.

Record	Notes
Thickness Measurement	Manually.
Thickness Measurement Location	Manually.
Thickness Monitoring Task	Automatically (when a Corrosion Analysis Setting are created).
TML Corrosion Analysis	Automatically (when a Thickness Measurement Location record is saved).

About Corrosion Analyses that Exclude TML Groups

You can exclude TML Groups from your TM analyses if none of the equipment that you will analyze in TM contain components, or if you want to analyze an asset without considering the components individually.

If you use this method:

- Asset Corrosion Analyses and Corrosion Analysis Settings will be created and linked to each Equipment record.
- All TMLs that you create will be linked directly to Equipment records representing assets.

Details

The following diagram illustrates the structure of Corrosion Analyses that do not include TML Group records. The boxes in the diagram are labeled according to the records that they represent, and the lines connecting the boxes represent links between these records in a Corrosion Analysis.
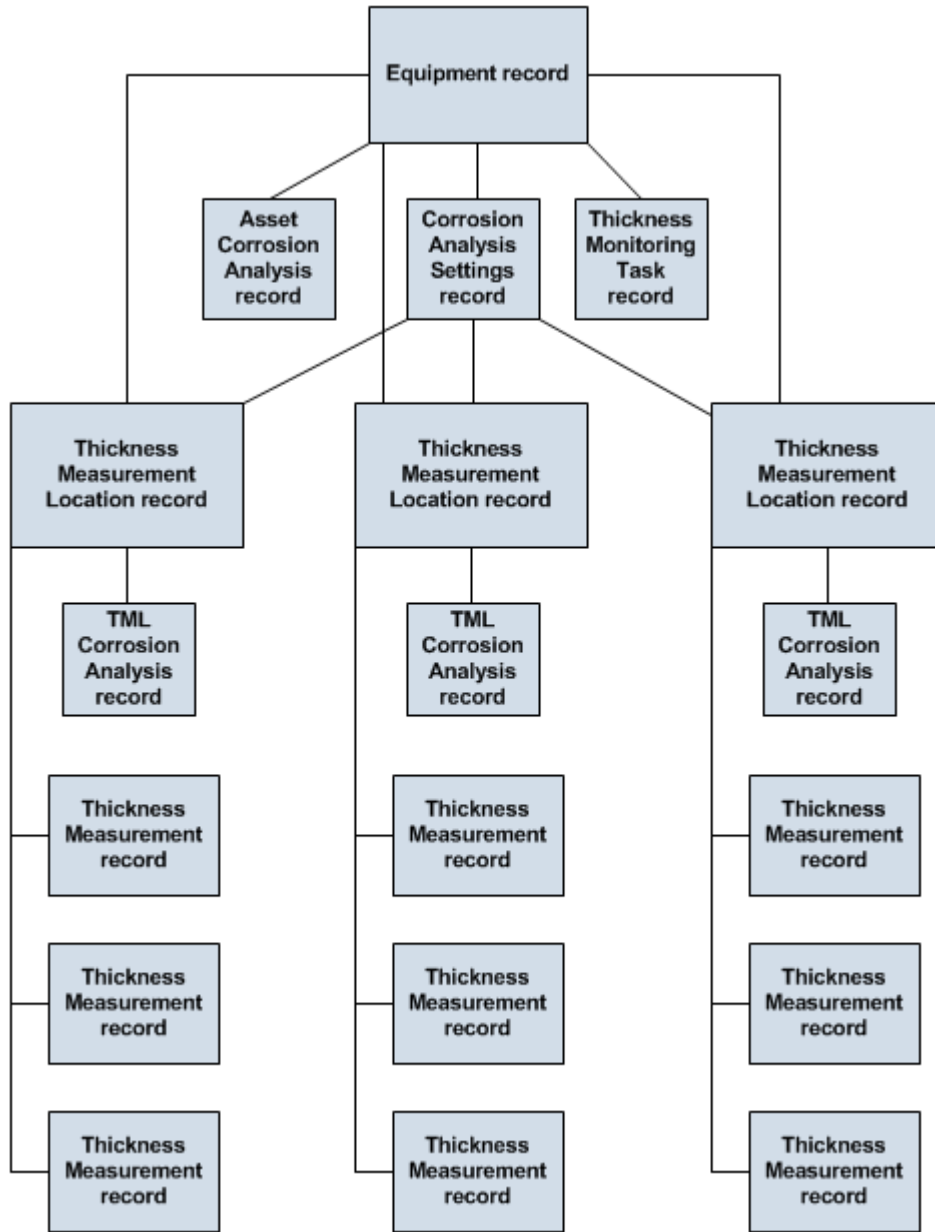
The following table provides information on how the records illustrated in the diagram are created manually or automatically.

Record	Notes
Corrosion Analysis Settings	Automatically.
Asset Corrosion Analysis	Automatically (when a Corrosion Analysis Setting are created for an Equipment record).
Equipment	Manually.
Thickness Measurement	Manually.
Thickness Measurement Location	Manually.

Record	Notes
Thickness Monitoring Task	Automatically (when a Corrosion Analysis Setting are created).
TML Corrosion Analysis	Automatically (when a Thickness Measurement Location record is saved).

About TML Groups and RBI Components

You can use TML Corrosion Analyses to determine corrosion rates in Risk Based Inspection (RBI). To complete the analysis, you must perform key steps in this workflow within the RBI module. If you want to specify that TML Group values should be used to calculate RBI corrosion rate values, you can perform this step using TM rather than RBI. Before you can link an RBI Component to a TML Group, you must first create an RBI Component for the asset, and then set the Source of Calculated Corrosion Rate field for the component to Component.

Note: For more information on RBI Components, see the Risk Based Inspection section of the documentation.

Details

To complete this task, you will need to link a TML Group to a Criticality Calculator RBI Component. When you link a Criticality Calculator RBI Component to a TML Group, RBI corrosion rate values for the RBI Analysis that you create are based on the average of the following values in the TML Corrosion Analysis:

- Long Term Corrosion Rate
- Short Term Corrosion Rate

In other words, the values in the preceding list will determine the following values in the Criticality Int. Corr. Deg. Mech. Eval record associated with the RBI Analysis that is created from the linked TML Group record:

- Short Term Avg. Corr. Rate
- Long Term Avg. Corr. Rate

Note: When you use TM to select a TML Group to link to a Criticality Calculator RBI Component, you will do so for only one TML Group at a time. Alternatively, via RBI, you can select more than one TML Group at a time to link to a Criticality Calculator RBI Component.
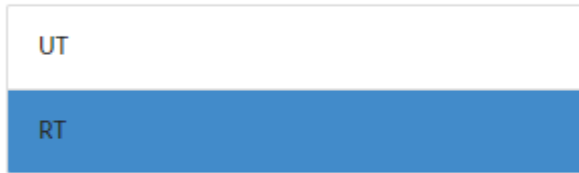
Create a TML Group

Procedure

1. Access the **Analysis Overview** workspace for the asset for which you want to create a TML Group.

2. In the left pane, select ┼ , and then select **TML Group**.

   The Select Analysis Type window appears.

Select Analysis Types

UT

RT

Cancel   Done

3. On the **Select Analysis Type** window, select either **UT** or **RT** for the analysis type, and then select **Done**.

   The new TML Group is created as a subcomponent of the asset.

Results

- The TML Group ID is automatically generated.
- The TML Group inherits the Corrosion Analysis Settings from the asset.
- You can make changes to the TML Group by accessing the datasheet.

Link a TML Group to RBI Components

Before You Begin

Create an RBI Component for the asset, and then set the Source of Calculated Corrosion Rate field for the component to Component.

Note: For more information on creating RBI Components, refer to the Risk Based Inspection section of the documentation.

About This Task

You can link multiple RBI Components to a TML Group.

Procedure

1. Access the **Analysis Overview** workspace for the TML Group to which you want to link an RBI Component.

2. In the workspace, select ⋮ , and then select **Manage RBI Components**.
   The **Manage RBI Components** window appears.

Manage RBI Components - TMLGRP-64262810724 -

RBI Component

☑ F0065-097-CS-1 ~ ~ ~ RBI EQU COMP ALL DATA

☑ F0065-097-EB-1 ~ ~ ~ RBI EQU COMP ALL DATA

Cancel   **OK**

3. Next to each RBI Component that you want to link to the TML Group, select the check box.

    Note: To unlink the TML Group, you can repeat this procedure and clear the check box.

4. Select **OK**.
   The TML Group is now linked to the RBI Components.

Results

- RBI Components linked to TML Groups inherit the corrosion rate values from the TML Groups. The resulting RBI Analysis is based on the average of the following values in the TML Corrosion Analyses linked to the TML Group:

    ◦ Short Term Corrosion Rate
    ◦ Long Term Corrosion Rate
    ◦ Controlling Corrosion Rate

Delete a Thickness Monitoring Location (TML) Group

Before You Begin

- When you delete a TML Group, the following linked records are also deleted:

    ◦ TMLs
    ◦ Thickness Measurements
    ◦ Corrosion Analysis Settings
    ◦ TML Corrosion Analyses
    ◦ Asset Corrosion Analyses

Procedure

1. Access the **Analysis Overview** workspace for the TML Group that you want to delete.

2. Select ⋮ , and then select **Delete**.

   A message appears, asking you to confirm that you want to delete the TML Group.

3. Select **Yes**.

   The TML Group is deleted.

Chapter

6

Thickness Measurements

Topics:

About Thickness Measurements

Thickness Measurements represent readings that are recorded at locations on an asset or one of its components. They are created and linked to TMLs.

Details

A Thickness Measurement is a value that quantifies the thickness of a given TML at a specific point in time.

Each TML will have various types of Thickness Measurements, including:

- **Base Measurement :** The first measurement taken for the TML.
- **Near Measurement :** The second-most-recently-recorded measurement for the TML.
- **Last Measurement :** The most-recently-recorded measurement for the TML.

Base, Near and Last Measurements are not recorded in the Thickness Measurements themselves. Instead, they are determined for the TML Corrosion Analysis by evaluating how many Thickness Measurements exist, and when the Thickness Measurements were created. After you create a new TML, you will want to record the base measurement, which represents the first recorded reading for that TML. Additional Thickness Measurements will be created later, as measurement readings are taken throughout the life of the asset.

Important: To ensure data integrity, existing Thickness Measurements should be managed using Thickness Monitoring instead of the Record Manager.

About Nominal and Actual Measurements

Each Thickness Measurement can be classified as either a nominal measurement or an actual measurement.

- A nominal measurement represents a reading that is not taken physically but is recorded from some other source, such as a design specification.
- An actual measurement represents a reading that is taken manually at the physical thickness measurement location on the equipment.

Details

Actual measurements are typically more accurate and result in calculations that are more representative of the actual asset. Nominal measurements may not be as accurate, but provide an efficient mechanism for recording initial measurement data.

Any nominal measurement value can be used in the creation of a nominal measurement. Nominal measurements are used only for the base measurement (i.e., the first measurement).

- Measurement data will be populated automatically for the initial Thickness Measurement linked to TMLs configured for nominal base measurements.
- Measurement data must be entered manually for Thickness Measurements that are linked to TMLs that are not configured for nominal base measurements.

Thickness Monitoring will use all active thickness measurements for performing TML Corrosion Analysis calculations. Nominal measurements will become inactive measurement automatically after two subsequent actual measurements have been recorded. In other words, if the Measurement Taken Date of any two actual measurements is after the Measurement Taken Date of a nominal measurement, the nominal measurement will become an inactive measurement.

About Skipped Measurements

GE Digital APM Thickness Monitoring provides the option to skip measurements. This applies when you want to satisfy inspection requirements, but do not want to take an actual measurement at the TML. When you skip a measurement, instead of creating a Thickness Measurement for a TML, you will create a Measurement Not Taken (MNT) record to store the inspection data.

Important: The GE Digital APM Thickness Monitoring Best Practice is to record actual readings for all inspections and not skip measurements. This section of the documentation provides information on using this functionality. All TM documentation outside of this section assumes that the Skip Measurements feature is disabled.

Details

Some reasons that you may want to skip measurements include:

- The physical location of certain TMLs may be difficult to reach or may require a shutdown in order to take a measurement.
- Your organization may have a strategy that calculates based on a certain percentage of TML measurements for an asset.
- Resource limitations may make it difficult or impossible to take measurements at all TMLs on an asset or its components.

In order to skip measurements in Thickness Monitoring, the Allow Measurements to be Skipped check box must be selected on the **TM Admin Preferences** page. Then you will need to create MNT records to represent any measurement that was skipped. After you have enabled this option and created MNT records, Corrosion Analyses containing skipped measurements will be updated to take those MNT records into account.

Skipping Measurements Consecutively

If you enable the option to skip measurements in TM, you will also have the option to enable a feature that allows you to skip measurements consecutively. When you do this, you will be able to create successive MNT records.

Example: Skipping Measurements Consecutively

Suppose that the TML TML01 is difficult to reach. As a result, your organizational policy dictates that while readings for all other TMLs on the associated piece of equipment must be taken every six months, a reading for TML01 must be taken only once per year, as illustrated in the following table.

TML	Scheduled Readings
TML01	June 1, 2014
	June 1, 2015
TML02	June 1, 2014
	December 1, 2014
	June 1, 2015
	December 1, 2015
TML03	June 1, 2014
	December 1, 2014
	June 1, 2015
	December 1, 2015

Suppose that you create an MNT record when a reading is skipped for TML01 on December 1, 2014. Next, suppose that, due to budget constraints at your facility, the scaffolding necessary to gain access to TML01 is unable to be built on June 1, 2015 (the date on which an actual thickness measurement reading is scheduled to be taken for this TML). In this case, you may want to create another MNT record for TML01, assuming that an actual measurement will be taken when possible.

Interpreting Calculations in Corrosion Analyses that Include Skipped Measurements

When active Thickness Measurements and MNT records exist in a Corrosion Analysis, all calculations, with the exception of Interval Next Inspection Date, are calculated as if MNT records are not included in your Corrosion Analysis.

Consider the calculation for Short Term Corrosion Rate. Short Term Corrosion Rate is calculated using the Short Term Loss and Short Term Interval, where:

Short Term Corrosion Rate = Short Term Loss / Short Term Interval

...where:

Short Term Loss = Near Measurement Value - Last Measurement Value

...and:

Short Term Interval = Last Measurement Date - Near Measurement Date

Example: Corrosion Analyses that Include Skipped Measurements

Consider the following measurements.

ReadingDateMeasurement (inches)

Reading	Date	Measurement (Inches)
Base	1/1/1985	.2
N/A	1/1/1987	<Measurement Not Taken>
Near	1/1/1990	.195
N/A	1/1/1993	<Measurement Not Taken>

Reading	Date	Measurement (Inches)
Last	1/1/1995	.19
N/A	1/1/2000	<Measurement Not Taken>

Short Term Loss = .195 - .19

Short Term Loss = .005

Short Term Interval = 1/1/1995 - 1/1/1990

Short Term Interval = 5 years

Short Term Corrosion Rate = .005 / 5

Short Term Corrosion Rate = .001

The Short Term Loss was not calculated using a Last Measurement Value of 1/1/2000, the date in the MNT record that is associated with the most recent inspection of this TML. There is no value associated with this date (or the date in ANY MNT record) and therefore, these records are ignored in all calculations with the exception of Interval Next Inspection Date.

Interval Next Inspection Date

When MNT records are included in a Corrosion Analysis, Interval Next Inspection Date is calculated using the following equation:

Interval Next Inspection Date = Last Measurement Date + Default Inspection Interval

Where **Last Measurement Date** is the most recent value in the Measurement Taken Date field of both the active Thickness Measurement and active MNT records linked to a given TM

Example: Interval Next Inspection Date

Consider a Default Inspection Interval of 60 months (i.e., 5 years) and a TML that is linked to records with the following Measurement Taken Dates:

Record	Measurement Taken Date
Thickness Measurement	1/1/2004
Measurement Not Taken	1/1/2005
Thickness Measurement	1/1/2006
Measurement Not Taken	1/1/2007

In this case, the Interval Next Inspection Date would be calculated as:

Interval Next Inspection Date = 1/1/2007 + 60 months

Interval Next Inspection Date = 1/1/2012

Skipped Measurements and TML Corrosion Analysis Fields

When the most recent date is from an MNT record, and when the Corrosion Rate of a TML is less than the Controlling Corrosion Rate of the asset, the following fields in the TML Corrosion Analysis are populated with data based on the Controlling Corrosion Rate:

- Asset Average Corrosion Rate
- Asset Average Corrosion Rate Remaining Life

- Asset Average Corrosion Rate Retirement Date
- Asset Average Corrosion Rate Next Inspection Date

This differs from when the fields are populated in a Corrosion Analysis that does not include skipped measurements.

Example: Skipped Measurements in TML Corrosion Analysis Fields

Consider an asset with:

- An Asset Corrosion Analysis with a Controlling Corrosion Rate of 2.9 Mils/year.
- A TML Corrosion Analysis for a TML linked to the asset, with a Corrosion Rate of 2.2 Mils/year. The most recent measurement date is from an MNT record.

In this case, the Asset Average Corrosion Rate would be set to 2.9 Mils/year.

This Asset Average Corrosion Rate value could be the result of any method that is specified to determine the asset controlling corrosion rate (Maximum, Average, or Formula). This differs from a Corrosion Analysis that does not include skipped measurements. When a Corrosion Analysis does not include skipped measurements, the Asset Average Corrosion Rate field is populated only when certain settings are specified, and this value can be the result only of an Average or Formula method.

Asset Average Corrosion Rate is an input to some of the calculations that are used to populate the Asset Average Corrosion Rate Remaining Life, Retirement Date, and Next Inspection Date fields. These calculations are performed using the same formulas that are used when a Corrosion Analysis does not include skipped measurements. The results of the same calculations in a Corrosion Analysis that includes skipped measurements versus a Corrosion Analysis that does not include skipped measurements, however, may differ because of the values that will be used to populate the Asset Average Corrosion Rate field in each of these Corrosion Analyses.

In every case, the value selected will be the most conservative (i.e., highest) corrosion rate, whether from the TML Corrosion Analysis Corrosion Rate field, or the Asset Corrosion Analysis Controlling Corrosion Rate field.

How Measurement Values Are Determined

The final value associated with a Thickness Measurement is stored in the Measurement Value field. Values are not, however, entered directly into the Measurement Value field itself. Instead, values are entered into the Readings field.

To determine the Measurement Value for a Thickness Measurement, one or more readings will be collected at a given TML. To account for the margin of error associated with user error, equipment malfunction, or environmental conditions, you may wish to collect multiple readings for each Thickness Measurement. The number of readings that you may take for a measurement will depend upon various factors, including your company's policies, the characteristics of the TML, and the method that you are using to collect the readings. The number of readings that you must take for each measurement is determined by the value specified in the Number of Readings field in the TML to which the Thickness Measurement is linked.

After you have determined how many readings you must take for a specific measurement and have collected those readings, you will add a Thickness Measurement and log the reading values in the Readings box. A calculation will be performed against the values in the Readings box, based on the settings that you have defined for measurement readings. Then, the Uncorrected Measurement field will be populated with the result of that calculation. Finally, the Measurement Value field will be populated with the value in the Uncorrected Measurement field. The Measurement Value field will then contain a value representing the final, corrected thickness measurement value.

Note: The Uncorrected Measurement field is meant to serve as an intermediate storage location between the Readings and Measurement Value fields. In Thickness Monitoring, the Measurement Value field is simply populated with the value in the Uncorrected Measurement field. You can create custom rules for the Measurement Value field so that the Uncorrected Measurement value is adjusted based upon additional factors and the result of that calculation becomes the value in the Measurement Value field.

About Measurement and Corrosion Rate Variance

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About Measurement and Corrosion Rate Variance Validation

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

Access Thickness Measurements

About This Task

You can access Thickness Measurements in any one of the following sections:

- **TMLs**
- **Measurements**

Procedure

1. To access Thickness Measurements in the **TMLs** section, perform the following steps:

    a) Access the **Analysis Overview** workspace for the asset or TML Group that contains the TML that you want to access.
    b) Select the **TMLs** tab.

    The **TMLs** section appears, displaying the following information:

    - If you selected an asset, a table of TMLs linked to the asset appears. This table includes TMLs linked to TML Groups or subcomponents linked to the selected asset.
    - If you selected a TML Group, a table of TMLs linked to the TML Group appears.

Analysis Overview
~ ~ AQA Test TML Plot

~ ~ AQA Test TML Plot

| Analysis Output | Remaining Life | TMLs | Details |

| **Summary** | Details |

Analysis Type: UT ▾

Calculated Date:	10/14/2019 12:58 AM	
Controlling Corrosion Rate (Maximum):	4.2653 Mils/year	Based on: TML_0STCR UT Active
Scheduled Next Inspection:	9/24/2029	Based on: TML_0STCR UT Active
Projected T-Min Date:	9/11/2039	Based on: TML_0STCR UT Active
Estimated Remaining Life From Today:	19 Years, 10 Months, 27 Days	
Maximum Allowable Working Pressure:	---	
Maximum Historical Corrosion Rate:	55.3207 Mils/year	
TMLs Below T-Min:	0	TMLs: None

TMLGRP-64263112476 -

TMLGRP-64263131884 -

11 UT Active

TML_0STCR UT Active

TML_1MEAS UT Active

TML_2MEAS UT Active

TML_40YRS_MEAS UT Active

TML_8MEAS UT Active

TML_ALL_INACT_MEAS UT Active

TML_EQLMEAS UT Active

TML_GROWTH UT Active

Note: If the TML Group that you want to access does not contain any TMLs, the **Details** section appears when you access the **Analysis Overview** workspace.

c) In the row containing the TML for which you want to access the Thickness Measurement, select ❯.

The row is expanded, and the Thickness Measurements appear below the row.

2. To access Thickness Measurements in the **Measurements** section, perform the following steps:

   a) Access the TML that contains the thickness measurement that you want to access.

   b) In the workspace, select the **Measurements** tab.
      The **Measurements** section appears, displaying a table of measurements linked to the TML.

   The visual cue that appears in each row indicates the color-coding category that is applicable to the Thickness Measurement.

   Note: By default, only active Thickness Measurements are displayed. If you want to access all measurements, clear the **Active Measurements Only** check box.

   c) If you want to access the Thickness Measurements datasheet, in the row containing the Thickness Measurement, select the link in the **MEASUREMENT TAKEN DATE** column.
      The Thickness Measurements datasheet appears.

0.758-8/23/2016 - Datasheets

Datasheet ID:

Thickness Measurements ⌄

Site:
Roanoke, VA

General
Information

Value(s)

Measurement Value

0.758 (Inches)

Measurement Taken Date

08/23/2016 17:24:35

Measurement Taken By

Smith, Jane ⌄

Measurement Comment

Measurement captured with UT reading.

Nominal

☐

Close

Tip: If needed, you can modify values in the available fields, and then select ⊞ to save your changes.

Add a Thickness Measurement

Before You Begin

• If you are recording readings for multiple Thickness Measurements, you can use the **Measurement Data Entry** workspace. Additionally, you can use a datalogger to record Thickness Measurement readings.

Procedure

1. Access Thickness Measurements for the TML to which you want to add a Thickness Measurement.

2. In the **Measurements** section, select ＋.

   Note: If skipping measurements has been enabled, select ＋, and then select **Add Measurement**.

   The **Add Measurement** window appears.

Add Measurement

TML ID	Readings	UOM	Measurement Date	Last Measurement
TML1 NO MEAS UT Active		Inches	8/17/2017 📅	1.25

Cancel   Done

3. In the **Readings** box, enter the measurement value.

   Note: The number of readings you will enter is determined by the value in the Number of Readings field in the TML datasheet.

4. In the **Measurement Date** box, enter the date when the measurement was taken.

5. Select **Done**.
   The new Thickness Measurement is added to the TML.

Next Steps

Calculate a Corrosion Analysis

Add a Nominal Measurement

Procedure

1. Access the TML for which you want to create a nominal measurement.
2. In the workspace, select the **TML Details** tab.
   The TML datasheet appears, displaying the **General Information** section.
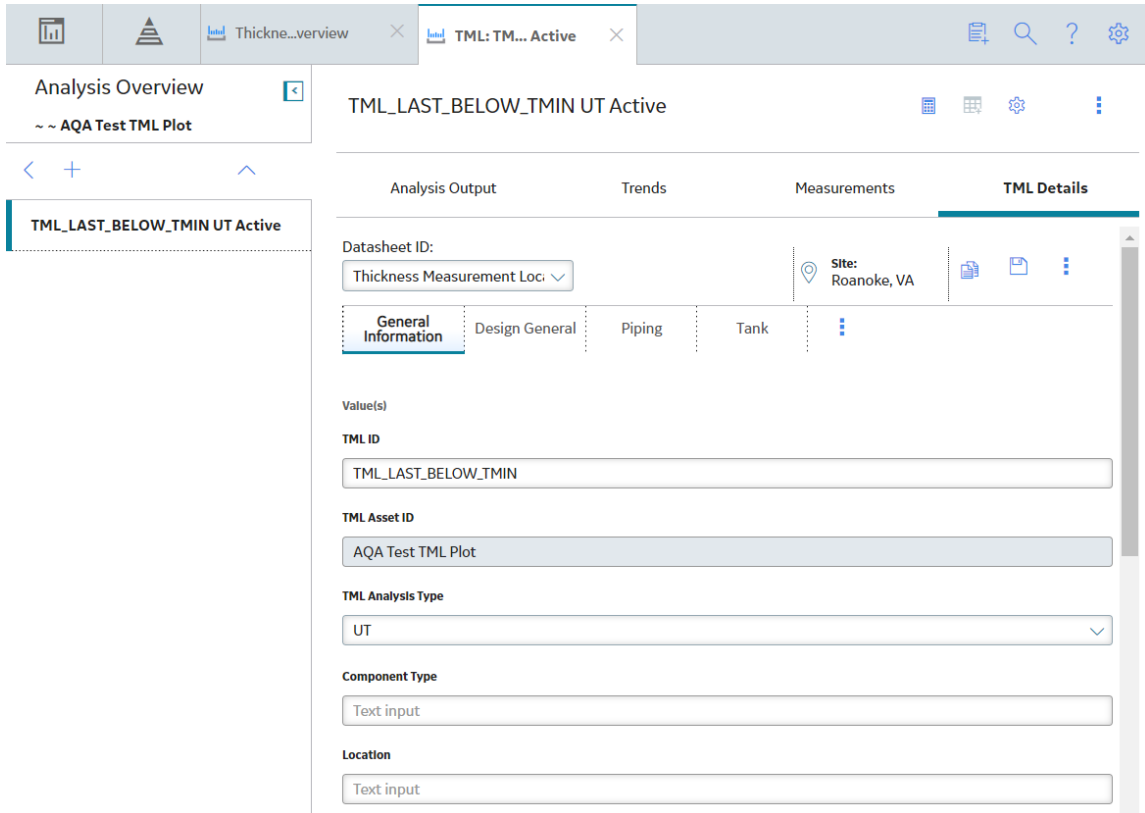
3. In the datasheet, select the **Design General** tab, and then, in the **Nominal Thickness** box, enter a value.

   -or-

   In the datasheet heading, select the **Piping** tab, and then select the appropriate values in the following boxes:

   • **Piping Nominal Diameter - NPS**
   • **Piping Nominal Diameter - DN**
   • **Schedule**

   The **Nominal Thickness** box is automatically populated with a value based on the values you selected.

4. Select 🖫.
   The nominal measurement values are saved.

5. Access the **Analysis Overview** page of the TML.

6. Select ⋮ , and then select **Nominal Measurements**.
   The **Nominal Measurements** window appears, displaying a list of possible Nominal Measurements.

Note: You can create nominal measurements only for TMLs that have a valid value in the Nominal Thickness field and do not have any active measurements.

7. **Optional:** If all the measurements are taken on the same date, specify the date in the **Common Measurement Taken Date** box.
8. Select the check boxes next to the TMLs for which you want to create measurements.
9. Specify the measurement taken dates for the TMLs.
10. Select **OK**.
    The nominal measurement creation process starts, and the progress appears on the upper-right corner of the **Nominal Measurements** window.

Tip: The nominal measurement creation process continues even if you close the **Nominal Measurements** window. You can select the ▦ button in the **Thickness Monitoring Overview** page to view the progress of the job in the scheduler. In case the nominal measurement creation fails for any TML, the job appears in the **Failed** section of the **Schedule Logs** page.

Results

For each check box you selected, a Thickness Measurement is created and linked to the corresponding TML. The value of the Thickness Measurement is marked as the Nominal Thickness value in the TML datasheet.

Note: When two or more active measurements are created, the nominal measurement becomes inactive. In such cases, the system ignores the nominal measurements and calculates the corrosion rate using actual measurements.

Create Measurement Not Taken (MNT) Records

Before You Begin

To Skip Measurements by creating MNT records, the **Allow Measurements to be Skipped** check box must be selected on the **TM Admin Preferences** page.

Optionally, you can also select the **Allow Consecutive Measurements to be Skipped** check box to allow the recording of multiple consecutive MNTs for a single TML without the recording of an actual measurement.

Procedure

1. Access Thickness Measurements for the TML to which you want to create an MNT record.
2. Select $+$, and then select **Add Skipped Measurement**.
   The **Add Skipped Measurement** window appears.

Add Skipped Measurement

TML ID	Readings	Measurement Date	Last Measurement
010-West Head UT Active	<Not Taken>	7/8/2015	0.732

Cancel   Done

3. In the **Readings** box, the default value <Not Taken> will populate and cannot be adjusted by the user.
4. In the **Measurement Date** box, enter the date for the measurement that you want to skip.
5. Select **Done**.
   The new MNT record is added to the TML.

Modify a Thickness Measurement

Procedure

1. Access Thickness Measurements for the TML that contains the Thickness Measurement that you want to modify.
2. In the **Measurements** section, in the row containing the Thickness Measurement that you want to modify, select the link in the **MEASUREMENT TAKEN DATE** column.
   The Thickness Measurement datasheet appears.

0.758-8/23/2016 - Datasheets

Datasheet ID:

| Thickness Measurements ⌄ |

◎ **Site:** Roanoke, VA | 🖫 | ⋮

┌─────────────┐
│ General   │
│ Information │
└─────────────┘

Value(s)

Measurement Value

| 0.758 (Inches) | ⏱ |

Measurement Taken Date

| 08/23/2016 17:24:35 | 🗓 |

Measurement Taken By

| Smith, Jane | ⌄ |

Measurement Comment

| Measurement captured with UT reading. |

Nominal

☐

[**Close**]

Tip: If you want to modify only the value in the **Readings** column, in the row containing the Thickness Measurement, select the link in the **MEASUREMENT VALUE** column, and then enter a value.

3. Modify values in the available fields, and then select 🖫.
   The Thickness Measurement is saved.

Use the Measurement Data Entry (MDE) Workspace

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group for which you want to record Thickness Measurements.

2. In the upper-right corner of the workspace, select 🔢.
   The **Measurement Data Entry** workspace appears, displaying a list of TMLs.

~ ~ AQA Test TML Plot

TML Asset ID	TML ID	Minimum Thickness	Last Measurement Value	Last Measurement Date	Readings	Measurement Taken Date	Measurement Taken By	Temperature
AQA Test TML Plot	TML_0MEAS	0.015 (Inches)	---	---	---	06/06/2019 00:41:04		---
AQA Test TML Plot	TML_0STCR	0.015 (Inches)	0.199 (Inches)	11/01/2000 00:00:00	---	06/06/2019 00:41:04		---
AQA Test TML Plot	TML_1MEAS	0.015 (Inches)	---	---	---	06/06/2019 00:41:04		---
AQA Test TML Plot	TML_2MEAS	0.015 (Inches)	0.25 (Inches)	01/01/2000 00:00:00	---	06/06/2019 00:41:04		---
AQA Test TML Plot	TML_40YRS_MEAS	0.015 (Inches)	0.228 (Inches)	01/15/2010 00:00:00	---	06/06/2019 00:41:04		---
AQA Test TML Plot	TML_8MEAS	0.015 (Inches)	2.32 (Inches)	06/13/1998 00:00:00	---	06/06/2019 00:41:04		---
AQA Test TML Plot	TML_ALL_INACT_MEAS	0.015 (Inches)	---	---	---	06/06/2019 00:41:04		---

3. In the **Common Measurement Data** section, enter values in the **Measurement Taken Date**, **Measurement Taken By**, and **Temperature** boxes.

   Note: If you have customized the common measurement data section, there may be additional boxes available.

4. In the data entry grid, enter values in the **Readings** box for each TML.
   Each time you enter a value into a **Readings** box, the other boxes in the row are populated with the values that you entered in step 3.

5. If you want to enter multiple readings for a TML, then perform one of the following steps:

   a. In the **Readings** box, enter the readings separated by semi-colon.
      The **Readings** box is populated with the values that you entered, separated by semi-colon.

   -or-

   a. In the **Readings** box, select ●●●.
      The **Readings** window appears.

   b. In each box, enter a value, and then select **OK**.
      The **Measurement Data Entry** workspace appears. The **Readings** box is populated with the values that you entered, separated by semi-colon.

6. Do one of the following:

a) Select ▣.

   The readings are saved.

   -or-

b) Select ▦.

   The readings are saved and the calculation starts for the asset.

Note: If you do not enter a value in the **Readings** box for all the TMLs displayed in the grid, a confirmation message appears, indicating that one or more measurement values were not entered. The message asks you to confirm that you want to continue.

Results

- For each reading that is saved, a Thickness Measurement is created and linked to the corresponding TML.
- You can now recalculate the corrosion analysis.

Delete a Thickness Measurement

Procedure

1. Access Thickness Measurements for a TML.

2. Next to the Thickness Measurement you want to delete, select 🗑.

   A message appears, asking you to confirm that you want to delete the measurement.

3. Select **Yes**.

   The Thickness Measurement is deleted.

   The ▦ button will change color to indicate that the analysis needs to be recalculated.

Chapter

7

T-Min Calculations

Topics:

About T-Min Calculations

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About the Calculated T-Min Value

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About Default T-Min

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About User-Defined T-Min

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About the Results of a T-Min Calculation

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About the Calculation Details

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About TML Calculation Details

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

Calculate Minimum Thickness (T-Min)

Before You Begin

Ensure there are values in the fields required to calculate T-Min for each TML.

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TMLs whose T-Min you want to calculate.

   Note: When you select an asset, T-Min will be calculated for TMLs linked to the asset, as well as TMLs linked to TML Groups the asset contains. When you select a TML Group, T-Min is calculated only for the TMLs it contains.

2. Select ⋮ , and then select **T-Min Calculator**.
   The **T-Min Calculator Disclaimer** appears.

   T-Min Calculator Disclaimer

   The T-Min Calculator is a tool designed for the engineer to validate T-Min values and is not intended to be a comprehensive tool. The T-Min results are based on internal pressure calculation and do not take into account mechanical or structural conditions.The Mechanical/Structural Engineer is responsible for assessing the design of the system and assuring that internal pressure is the proper design criteria. Engineering analysis and industry best practices should be used to assess the validity of the results obtained by this tool.

   | OK | Cancel |

3. Read the disclaimer completely, and then, if you agree, select **OK**.
   The **T-Min Calculator** workspace appears, displaying a list of TMLs.

4. In the list, select the check boxes corresponding to the TMLs whose T-Min you want to calculate.

   Note: If you want to specify a user defined T-Min value for a TML, enter a value in the corresponding **User Defined** box.

5. Select **Calculate T-Min**.
   The **T-Min Calculation Output** dialog box appears. After the operation is complete, it displays the calculation log.

T-Min Calculation Results History

TML : 007-East Head UT Active

==

Minimum Thickness Value: 0.4585

Minimum Thickness Source: Calculated

By User: Smith, Jane

On Date: 2/5/2014

Proposed T-min Value: 0.4585

Proposed Source: Calculated

Calculated T-Min Value: 0.4585

User Defined T-Min value: Not specified.

Default T-min value: Not specified.

Calculated T-min Details

Formula Used

Public\Rules Library\Meridium\Thickness Monitoring\T-Min

OK

6. Select **OK**.

   In the **T-Min Calculator** workspace, ✔ and ⊘ images appear next to the TML IDs to indicate whether the TMLs have been calculated successfully. The **Calculated** column is updated to reflect the new calculated values.

   Note: If you want to investigate why a TML was not calculated, select the ⊘ image next to the TML ID.

The **T-Min Calculation Output** dialog box appears, displaying the calculation log.

T-Min Calculation Output

TML : 006-Shell Course 3 UT Active

===

By User: JSmith

On Date: 5/3/2017

Proposed T-Min Value:

Proposed Source:

Calculation Failed

Invalid value of Design Code.

===

Default T-Min value: 0

===

User Defined T-Min value: Not specified.

===

OK

7. For each TML, in the last column, select a value in the **Selected T-Min Source** box.

   Note: The default selection in the **Selected T-Min Source** list is the field containing the most conservative (i.e., the largest) value, based on the Calculated, Default, Nominal, and User Defined T-Min values. For example, if the User Defined T-Min value was 0.81, and the Calculated T-Min value was 0.76, the Final T-Min Source would default to User Defined.

   The selection in the **Selected T-Min Source** list determines what value is saved as the TML's current T-Min Value. For example, if you specified a User Defined T-Min value of 0.18, and the Calculated T-Min value was 0.281, you could choose to save the value in the Calculated field by selecting Calculated in the **Selected T-Min Source** list, instead of User Defined.

8. If you want to review the output of the most recent calculations before saving, in the upper-right corner of the workspace, select **View Calculation Output**.

The **T-Min Calculation Output** dialog box appears, displaying the log of the most recent T-Min calculations.

9. Select **Save T-Min Values**.
The new T-Min Values, as determined by the selected T-Min source for each TML, are saved, and the analysis is recalculated.

Tip: To return to the **Analysis Overview** workspace, select ⟨ .

View T-Min Calculation History

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TMLs whose T-Min you want to calculate.

   Note: When you select an asset, T-Min will be calculated for TMLs linked to the asset, as well as TMLs linked to TML Groups the asset contains. When you select a TML Group, T-Min is calculated only for the TMLs it contains.

2. Select ⋮ , and then select **T-Min Calculator**.
The **T-Min Calculator Disclaimer** appears.

T-Min Calculator Disclaimer

The T-Min Calculator is a tool designed for the engineer to validate T-Min values and is not intended to be a comprehensive tool. The T-Min results are based on internal pressure calculation and do not take into account mechanical or structural conditions.The Mechanical/Structural Engineer is responsible for assessing the design of the system and assuring that internal pressure is the proper design criteria. Engineering analysis and industry best practices should be used to assess the validity of the results obtained by this tool.

OK	Cancel

3. Read the disclaimer completely, and then, if you agree, select **OK**.
The **T-Min Calculator** workspace appears, displaying a list of TMLs.

4. At the end of the row corresponding to the TML whose history you want to view, select ⏱.
   The **T-Min Calculation Output** dialog box appears, displaying a historical log of all calculations that were saved for that TML.

T-Min Calculations

About T-Min Calculations

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About the Calculated T-Min Value

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About Default T-Min

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About User-Defined T-Min

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About the Results of a T-Min Calculation

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About the Calculation Details

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About TML Calculation Details

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

Calculate Minimum Thickness (T-Min)

Before You Begin

Ensure there are values in the fields required to calculate T-Min for each TML.

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TMLs whose T-Min you want to calculate.

   Note: When you select an asset, T-Min will be calculated for TMLs linked to the asset, as well as TMLs linked to TML Groups the asset contains. When you select a TML Group, T-Min is calculated only for the TMLs it contains.

2. Select ⋮ , and then select **T-Min Calculator**.
   The **T-Min Calculator Disclaimer** appears.

   ## T-Min Calculator Disclaimer

   The T-Min Calculator is a tool designed for the engineer to validate T-Min values and is not intended to be a comprehensive tool. The T-Min results are based on internal pressure calculation and do not take into account mechanical or structural conditions.The Mechanical/Structural Engineer is responsible for assessing the design of the system and assuring that internal pressure is the proper design criteria. Engineering analysis and industry best practices should be used to assess the validity of the results obtained by this tool.

OK	Cancel

3. Read the disclaimer completely, and then, if you agree, select **OK**.
   The **T-Min Calculator** workspace appears, displaying a list of TMLs.

4. In the list, select the check boxes corresponding to the TMLs whose T-Min you want to calculate.

   Note: If you want to specify a user defined T-Min value for a TML, enter a value in the corresponding **User Defined** box.

5. Select **Calculate T-Min**.
   The **T-Min Calculation Output** dialog box appears. After the operation is complete, it displays the calculation log.

T-Min Calculation Results History

TML : 007-East Head UT Active

==

Minimum Thickness Value: 0.4585

Minimum Thickness Source: Calculated

By User: Smith, Jane

On Date: 2/5/2014

Proposed T-min Value: 0.4585

Proposed Source: Calculated

Calculated T-Min Value: 0.4585

User Defined T-Min value: Not specified.

Default T-min value: Not specified.

Calculated T-min Details

Formula Used

Public\Rules Library\Meridium\Thickness Monitoring\T-Min

OK

6. Select **OK**.

   In the **T-Min Calculator** workspace, ✔ and ⊘ images appear next to the TML IDs to indicate whether the TMLs have been calculated successfully. The **Calculated** column is updated to reflect the new calculated values.

☐	⊘	006-Shell Course 3 UT Active	F0065-097-3				0.625	User Defined	---	Select ... ⌄	🕐
☐	✓	007-East Head UT Active	F0065-097-1		---	0	0.4585	0.4585	Calculated	0.4585	Calculated ⌄	🕐

Note: If you want to investigate why a TML was not calculated, select the ⊘ image next to the TML ID.

The **T-Min Calculation Output** dialog box appears, displaying the calculation log.

T-Min Calculation Output

TML : 006-Shell Course 3 UT Active

==

By User: JSmith
On Date: 5/3/2017

Proposed T-Min Value:
Proposed Source:

Calculation Failed

Invalid value of Design Code.

==
Default T-Min value: 0
==
User Defined T-Min value: Not specified.
==

OK

7. For each TML, in the last column, select a value in the **Selected T-Min Source** box.

   Note: The default selection in the **Selected T-Min Source** list is the field containing the most conservative (i.e., the largest) value, based on the Calculated, Default, Nominal, and User Defined T-Min values. For example, if the User Defined T-Min value was 0.81, and the Calculated T-Min value was 0.76, the Final T-Min Source would default to User Defined.

   The selection in the **Selected T-Min Source** list determines what value is saved as the TML's current T-Min Value. For example, if you specified a User Defined T-Min value of 0.18, and the Calculated T-Min value was 0.281, you could choose to save the value in the Calculated field by selecting Calculated in the **Selected T-Min Source** list, instead of User Defined.

8. If you want to review the output of the most recent calculations before saving, in the upper-right corner of the workspace, select **View Calculation Output**.
   The **T-Min Calculation Output** dialog box appears, displaying the log of the most recent T-Min calculations.

9. Select **Save T-Min Values**.
   The new T-Min Values, as determined by the selected T-Min source for each TML, are saved, and the analysis is recalculated.

   Tip: To return to the **Analysis Overview** workspace, select ‹ .

View T-Min Calculation History

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group that contains the TMLs whose T-Min you want to calculate.

   Note: When you select an asset, T-Min will be calculated for TMLs linked to the asset, as well as TMLs linked to TML Groups the asset contains. When you select a TML Group, T-Min is calculated only for the TMLs it contains.

2. Select ⋮ , and then select **T-Min Calculator**.
   The **T-Min Calculator Disclaimer** appears.

T-Min Calculator Disclaimer

The T-Min Calculator is a tool designed for the engineer to validate T-Min values and is not intended to be a comprehensive tool. The T-Min results are based on internal pressure calculation and do not take into account mechanical or structural conditions.The Mechanical/Structural Engineer is responsible for assessing the design of the system and assuring that internal pressure is the proper design criteria. Engineering analysis and industry best practices should be used to assess the validity of the results obtained by this tool.

OK	Cancel

3. Read the disclaimer completely, and then, if you agree, select **OK**.
   The **T-Min Calculator** workspace appears, displaying a list of TMLs.

4. At the end of the row corresponding to the TML whose history you want to view, select 🕒.
   The **T-Min Calculation Output** dialog box appears, displaying a historical log of all calculations that were saved for that TML.

Chapter

8

Dataloggers in Thickness Monitoring

Topics:

About Dataloggers in Thickness Monitoring (TM)

Dataloggers are data collection devices, which are used to measure and record the thickness of a component. Using the Thickness Monitoring (TM) module, you can:

- Send data related to a TML to the datalogger.
- Receive data from the datalogger (after you collect measurement data in the field and record it in the datalogger).

Important: If your company restricts the use of removable storage devices in USB ports, the datalogger device may not function as expected. You must request an exemption to the company policy from your IT administrator.

The following dataloggers are supported in TM:

- GE DMS Go
- GE DMS Go+
- GE DMS2
- Olympus (Panametrics) 37DL Plus Ultrasonic Thickness Gage
- Olympus (Panametrics) 38DL Plus Ultrasonic Thickness Gage

For each datalogger, GE Digital APM provides:

- Baseline Datalogger Mapping records, which are used to send or receive data from the datalogger.
- Default datalogger settings, which you must review and modify if needed before you use the datalogger.

Access the TM Dataloggers page for an Asset or TML Group

About This Task

This topic describes how to access the **TM Dataloggers** page for an asset or TML Group. You can also access the TM Dataloggers page for multiple assets.

Procedure

1. Access the **Analysis Overview** workspace for the asset or TML Group for which you want to access the **TM Dataloggers** page.

2. In the upper-right corner of the page, select ⋮ , and then select **Dataloggers**.
   The **TM Dataloggers** page appears, displaying the **Send To** section. In the section, a list of TMLs linked to the selected asset or TML Group appears. The list also includes TMLs linked to any TML Groups in the asset. By default, the check boxes in all the rows are selected.

Next Steps

Modify the datalogger settings.

Access the TM Dataloggers page for Multiple Assets

About This Task

This topic describes how to access the **TM Dataloggers** page for multiple assets. You can also access the **TM Dataloggers** page for a single asset or TML Group.

Procedure

1. Access the **Thickness Monitoring Overview** page for the functional location that contains the assets for which you want to access the **TM Dataloggers** page.

2. In the upper-right corner of the page, select ⧉⧉.
   The **Select Assets to Load for Dataloggers** window appears, displaying a list of assets that the functional location contains.

Select Assets to Load for Dataloggers

	Equip Tech No	Asset ID
☐		
☐	TK002-097	2498381
☐	B0001-097	2509063
☐	D0001-097	2509075
☐	D0001A-097	2509077
☐	D0002-097	2509079
☐	D0003-097	2509081
☐	D0004-097	2509083
☐	E0001-097	2509097

Cancel   Done

3. In the rows containing the assets for which you want to access the **TM Dataloggers** page, select the check boxes.

   Note: We recommend that you select the same type of assets (i.e., either Equipment or Functional Locations).

4. Select **Done**.
   The **TM Dataloggers** page appears, displaying the **Send To** section. In the section, a list of TMLs linked to the selected assets appears. The list includes TMLs linked to any TML Groups in the assets.

Next Steps

Modify the datalogger settings.

Modify Datalogger Settings

Before You Begin

- Datalogger settings are specific to the user, data source, and browser. If you log in as a different user, switch browsers, or use a different data source, you will need to reconfigure your datalogger settings.
- When you send data to a GE DMS Go or GE DMS Go+ datalogger, GE Digital APM creates a folder in the USB drive. Therefore, you must have the Write permission to the USB drive on the machine that you will use to send data.

Procedure

1. Access the **TM Dataloggers** page.

2. In the upper-right corner of the page, select ⚙.
   The datalogger settings appear.

GE DMS2				⌄
Connection Type	Serial Connection Settings		Device Data Options	
	Baud Rate		Datalogger Service Port	
◯ USB	Per Device Setting ⌄		2014	
⦿ Serial				
	COM Port			
	COM1 ⌄			

3. In the drop-down list box at top of the workspace, select the datalogger whose settings you want to configure. By default, the datalogger that you used previously is selected.
4. If you want to use the GE DMS Go or GE DMS Go+ datalogger, specify a directory in the **File Directory** box. Files will be sent to and received from the **Meridium** folder that is created in the specified directory.
5. As needed, enter values in the remaining fields, and then select **Save**.
   The datalogger settings are modified.

Results

If you have already selected the assets that you want to send to the datalogger, then the **Send To** section appears. Otherwise, the **Select Assets to Load for Dataloggers** window appears, allowing you to select the assets for which you want to send data to the datalogger.

Next Steps

Send data to the datalogger.

Send Data to a Datalogger

Before You Begin

- Install the Meridium Device Service on the machine that you will use with dataloggers. If you do not install it, when you attempt to send or receive data, you will be prompted to install it.
- Refer to the limitations when using a datalogger.
- If needed, modify the datalogger settings.

Procedure

1. Access the **TM Dataloggers** page.
2. At the top of the page, in the drop-down list box, select the datalogger to which you want to send data. By default, the datalogger that you previously used is selected.
   In the **Send To** section, a list of TMLs linked to the selected assets appears. By default, the checkbox corresponding to **TML Asset ID** and the check boxes corresponding to all the TML records are selected.

Send To

	TML ASSET ID	TML ID	LOCATION	LAST MEASUREMENT DATE
☑	AQA Test TML Plot	TML_0STCR		8/13/2019
☑	AQA Test TML Plot	TML_1MEAS		8/13/2019
☑	AQA Test TML Plot	TML_0MEAS		
☑	AQA Test TML Plot	TML_2MEAS		8/13/2019
☑	AQA Test TML Plot	TML_SOME_INACT_M		8/13/2019
☑	AQA Test TML Plot	TML_ALL_INACT_ME		
☑	AQA Test TML Plot	TML_LAST_BELOW_T		8/13/2019
☑	AQA Test TML Plot	TML_8MEAS		8/13/2019

3. In the **Send To** section, do one of the following:

    •   If you want to send all the TML records to the device, select **Send**.
    •   If you want to send selected TML records to the device, select the check boxes corresponding to the required TML records, and then select **Send**.

    •

    Send To

	TML ASSET ID	TML ID	LOCATION	LAST MEASUREMENT DATE
☑	AQA Test TML Plot	TML_0STCR		8/13/2019
☐	AQA Test TML Plot	TML_1MEAS		8/13/2019
☐	AQA Test TML Plot	TML_0MEAS		
☑	AQA Test TML Plot	TML_2MEAS		8/13/2019

    A message appears, asking you to confirm whether you want to send the selected TML records to the device.

4. Select **Yes**.

    The selected TML records are sent to the device.

    At the end of the section, the red 📋 changes to a green 📋 to indicate that the device is connected.

    If the data related to an asset was already sent to the datalogger previously, a message appears, asking you to confirm whether you want to overwrite the existing data on the datalogger. If you choose to overwrite, the data related to the asset is replaced with the data that you send. If you choose not to overwrite, the data will not be sent to the datalogger.

    The date is sent to the datalogger. When the operation is complete, the green 📋 changes to a red 📋.

Add Columns to the Send To Grid

Before You Begin

- The data in the columns that you add is not automatically sent to the datalogger. If, however, you want to send this data to the datalogger, you must create a mapping for the corresponding field on the **TM Admin Preferences** page.
- The columns that you add are specific to the user, data source, and browser. If you log in as a different user, switch browsers, or use a different data source, the columns that you have added will not appear.

Procedure

1. Access the **TM Dataloggers** page.

2. In the upper-left corner of the **Send To** section, select 🗐.
   The **Choose Columns** window appears, displaying a list of fields in the Asset family in the left section.
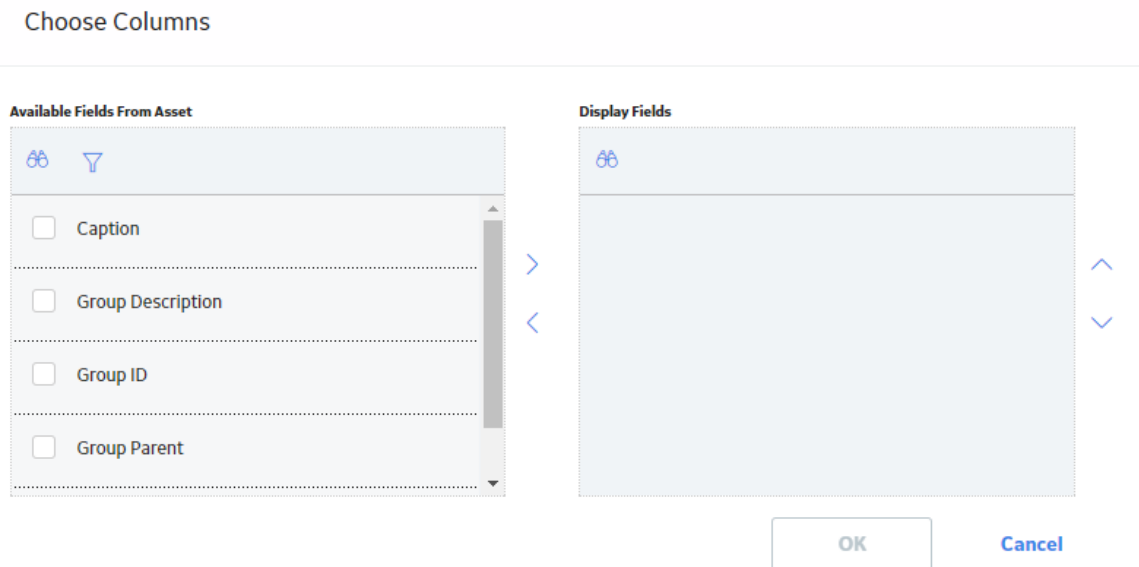
3. If you want to add fields from the Asset family, skip to step 5.

4. Select ▽, and then in the **Family** box, select the family from which you want to add fields.
   A list of fields in the selected family appear in the left section. If, however, the column for a field has already been added to the grid, or the field has been defined in a mapping, it does not appear in the list.
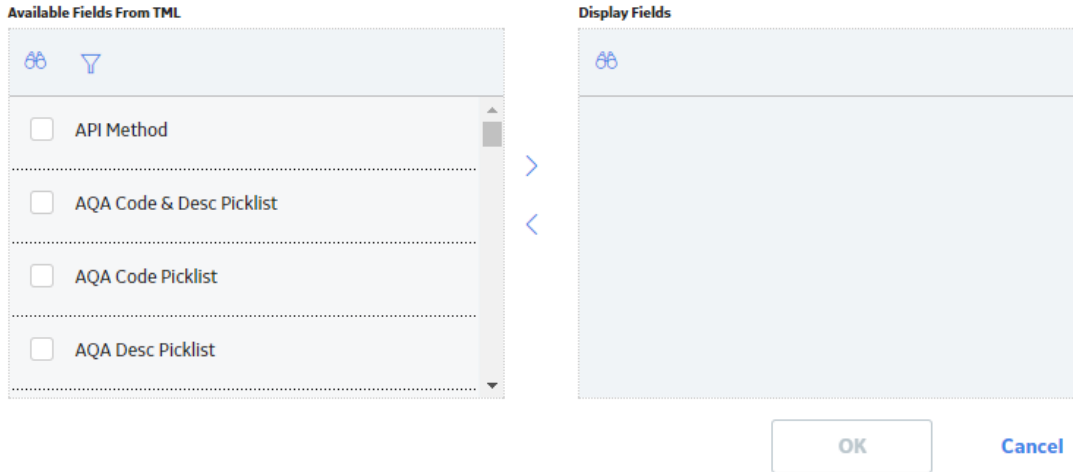
5. Select the rows containing the fields that you want to add to the grid, and then select ❭.
   The selected fields appear in the right section.

6. If you want to add fields from another family, repeat steps 4-5.

   Tip: You can change the sequence of the fields using the ⌃ and ⌄ buttons.

7. Select **OK**.
   Columns for the selected fields appear on the right side of the grid in the **Send To** section (i.e., after the default columns).

Remove Columns from the Send To Grid

About This Task

You cannot remove the default columns that appear in the grid in the **Send To** section. You can only remove the columns that you have added from the **Column Chooser** window.

Procedure

1. Access the **TM Dataloggers** page.

2. In the upper-left corner of the **Send To** section, select ⬚.
   The **Choose Columns** window appears. In the right section, a list of fields for the columns that you have already added to the grid appears.

3. If you want to remove fields from the Asset family, skip to step 5.

4. Select ▼, and then, in the **Family** box, select the family from which you want to remove the fields.
   In the right section, a list of fields that you have already added to the grid appears.

Choose Columns

Available Fields From TML

Display Fields

Minimum Thickness

Minimum Yield Strength

Nominal Thickness

Outside Diameter

Number of Readings

Outside Radius

Override Allowable Stress

OK   Cancel
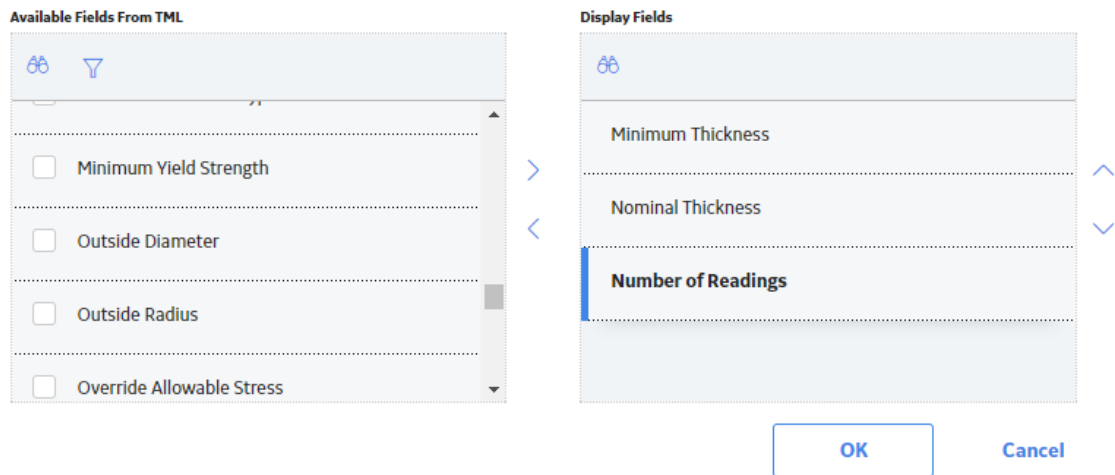
5. Select the rows containing the fields that you want to remove from the grid, and then select ⟨.
   The selected fields are removed from the right section.

Choose Columns

Available Fields From TML

Display Fields

API Method

AQA Code & Desc Picklist

AQA Code Picklist

AQA Desc Picklist

OK   Cancel
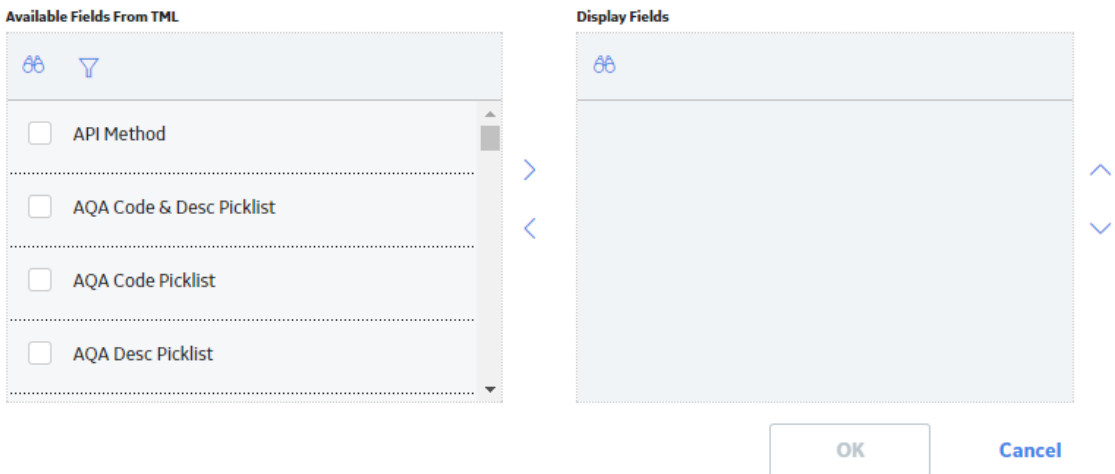
6. If you want to remove fields from another family, repeat steps 4-5.
7. Select **OK**.
   Columns for the selected fields are removed from the grid in the **Send To** section.

Receive Data from a Datalogger

Before You Begin

- Install the Meridium Device Service on the machine that you will use with dataloggers. If you do not install it, when you attempt to send or receive data, you will be prompted to install it.

Procedure

1. Access the **TM Dataloggers** page.
2. At the top of the page, in the drop-down list box, select the datalogger from which you want to receive data. By default, the datalogger that you previously used is selected.
3. Ensure that the datalogger settings are correct.
4. Select the **Receive From** tab.
   The **Receive From** section appears.
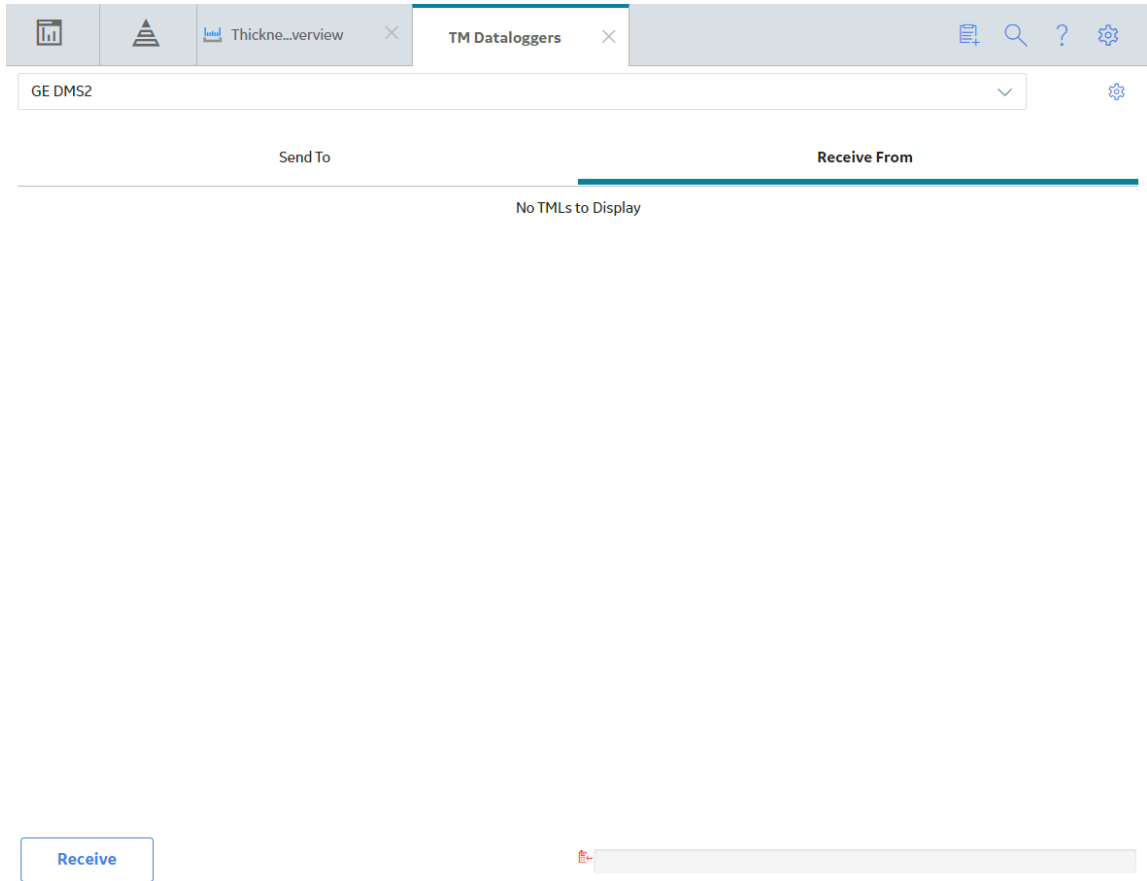
5. Select **Receive**.
   The **Select Files to Receive** window appears, displaying a list of files that store the measurement data. By default, the check boxes corresponding to all the files are selected.

Select Files to Receive

	Filename
☑	E:\meri\AUTO TM EQU1.dmsdr
☑	E:\meri\.dmsdr

Cancel   **Done**

6. If you do not want to receive the data stored in a file, clear the check box.

7. Select **Done**.
   The data is received from the datalogger, and stored in Thickness Measurement records.

8. In the **Receive From** section, do one of the following:

   - If you want to save all the TML records, select the check box corresponding to **TML Asset ID**, and then select **Save**.

	TML ASSET ID	TML ID	MEASUREMENT TAKEN DATE	READINGS
☑	AQA Test TML Plot	TML_0MEAS		
☑	AQA Test TML Plot	TML_0STCR		
☑	AQA Test TML Plot	TML_1MEAS		
☑	AQA Test TML Plot	TML_2MEAS		
☑	AQA Test TML Plot	TML_40YRS_MEAS		

   - If you want to save selected TML records, select the check boxes corresponding to the required TML records, and then select **Save**.

	TML ASSET ID	TML ID	MEASUREMENT TAKEN DATE	READINGS
▣				
☑	AQA Test TML Plot	TML_0MEAS		
☐	AQA Test TML Plot	TML_0STCR		
☐	AQA Test TML Plot	TML_1MEAS		
☑	AQA Test TML Plot	TML_2MEAS		
☑	AQA Test TML Plot	TML_40YRS_MEAS		

   The selected TML records are saved.

   Note: If readings are not taken for a measurement, however, Measurement Not Taken records are not created.

Results

The following analyses are recalculated:

- TML Corrosion Analysis linked to each TML whose measurement data you have received.
- Asset Corrosion Analysis linked to each asset whose measurement data you have received.
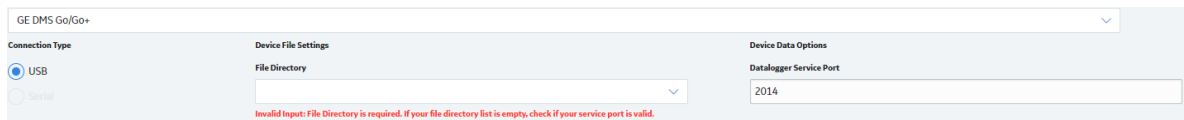
Troubleshoot Datalogger Issues

You may experience the following issues when using the datalogger in Thickness Monitoring:

- Datalogger device is not connected to the system.
- Meridium Device Service not found.
- Device Service is installed, but USB is not accessible due to permissions.
- Ultra-MATE software version compatibility Issue with DMS Go+ device.
- Incorrect readings are received.
- Meridium Device Service is not running under an authorized service account.
- OnDMS Go/DMS Go+ device readings with A-Scan saved do not properly load in the Datalogger interface
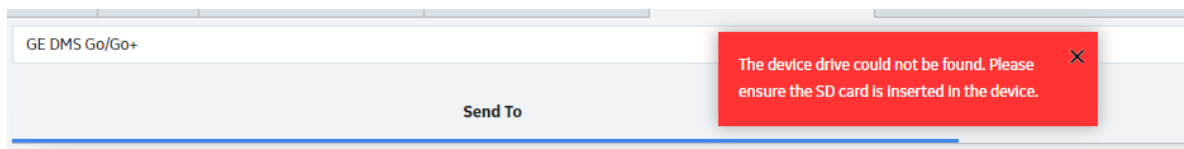
Datalogger device is not connected to the system

In the datalogger settings window, the **File Directory** drop-down list box is empty. Instead, the following error message appears below the **File Directory** drop-down list box:`Invalid Input: File Directory is required. If your file directory list is empty. Check if your service port is valid.`

When you attempt to send TMLs, the following error message appears:`The device drive could not be found. Please ensure the SD card is inserted in the device.`

Cause

This issue may occur because of the following reason:

- The Meridium Device Service is not running under an authorized service account.

Note: This issue is applicable only for DMS Go/Go+ devices.

Solution

To check if the datalogger device is connected,

1. Access the Devices and drives in windows.
2. Verify if the USB Drive is available.
3. If the USB Drive is not available, make sure that the datalogger device is properly connected to the system.

Meridium Device Service not found

When you attempt to send data to a datalogger, following error is displayed on the TM Dataloggers page:

```
Meridium Device Service Not Found
```

Meridium Device Service Not Found

Download

Once the installer has completed and the service is running, click the
Continue button and retry the operation.

Continue

Cause

This issue may occur because of any of the following reasons:

- Meridium Device Service is not installed in the system.
- GE Digital APM uses a secured URL (https).

Solution

Install the Meridium Device Service on page 193 on all the machines that connect to devices with
Thickness Monitoring..

Note: If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://
digitalsupport.ge.com/communities/en_US/Article/HOW-TO-V4-Thickness-Monitoring-Devices-
Dataloggers-and-Secure-HTTPS-Browsers-on-Windows-Machines-1553989641712 to install the
Meridium Device Service.

Device Service is Installed, but USB is not accessible due to permissions

When you attempt to send TML data, the following error message appears:

```
Error: <Directory>.dmsdr was not successfully sent to the GE DMS Go/Go+
device. Please check and make sure that all of the settings for the
current device are correct. This might be due to the device having to
change the file name because of limitations inherent in the device.
```

Additionally, the following error message appears in the log file:

```
Sending message of type ACTION_FAILED to client.
```

Datalogger Errors

Status	Message
🔴	Error: D:\Meridium\AQA Test TML Plot.dmsdr was not successfully sent to the GE DMS Go/Go+ device. Please check and make sure that all of the settings for the current device are correct. This might be due to the device having to change the file name because of limitations inherent in the device.

Note: This issue is applicable only for DMS Go/Go+ devices.

Cause

This issue may occur because of the following reason:

- You don't have USB access in your system.

To verify if you have USB access in your system, perform the following steps:

1. Navigate to the USB drive folder.
2. Access the Meridium folder.
3. Create a text file.
   If you see an Access Denied message, you don't have USB access in your system.

Solution

Contact you system administrator to provide USB access in your system.

Ultra-MATE software version compatibility Issue with DMS Go+ device

When you attempt to send TML data using a DMS Go+ device, the data processing starts, but never gets completed. The loading spinner continues to spin as shown in the image below.

You can also access the log file from the log folder in the service path folder to check the following error message:

```
Exception occurred while processing the resuestLength cannot be less than
zero. Parameter name: length
```

Cause

The data format in DMS Go+ is changed in version 3.29. UltraMATE version older than 2.60.35 are not able to read data created with DMS Go+ version 3.29 due to the changed data format. UltraMATE version 2.60.28 or lower are able to read data created with DMS Go+ version 3.28 or lower.

Solution

GE Digital recommends customers with an existing valid license of UltraMATE software to download the UltraMATE version 2.60.35 from the https://www.gemeasurement.com/download-center. Contact GE Technical Support to get the password to unzip and install the UltraMATE software.

Incorrect readings are received

If you are a non-English customer, you may receive incorrect readings from the device.

Cause

When you receive thickness measurement data from a TM Datalogger in a system where the Windows Region format is set to any region other than English (United States), you may receive incorrect measurement values. For example, if you are using GE Digital APM in a system where the windows culture is set to Finnish (fi-FL) culture, a value of 0.75 inches may be received as 75234724750 inches.

Solution

- Follow the instructions in https://digitalsupport.ge.com/communities/en_US/Article/V4-3-Thickness-Monitoring-Datalogger-sends-incorrect-readings-into-APM-when-using-Finnish-culture-fi-FL-1552686877133.
  or
- Uninstall the previous version and Install the Meridium Device Service on page 193 on all of the machines that connect to devices with Thickness Monitoring.

Meridium Device Service is not running under an authorized service account

When you attempt to send TML data, following error message appears:

```
Error: <Directory>.dmsdr was not successfully sent to the GE DMS Go/Go+
device. Please check and make sure that all of the settings for the
current device are correct. This might be due to the device having to
change the file name because of limitations inherent in the device.
```
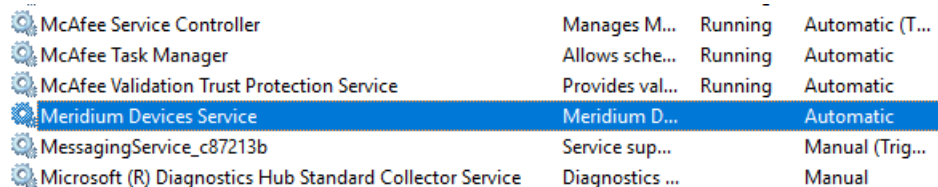
Note: This issue is applicable only for DMS Go/Go+ devices.

Cause

Depending on the IT security policy of your company, Meridium Device Service may use an unauthorized system service account.

Solution

1. Run `services.msc` to open the Services Manager.

2. From the list of services, right-click on Meridium Devices Service, and then select **Properties**.
3. Access the **Log On** tab.
4. Select **This account**.
5. Enter your administration credentials, and then select **OK**.

OnDMS Go/DMS Go+ devicereadings with A-Scan saved do not properly load in the Datalogger interface

When you attempt to receive the TML data using a DMS Go/DMS Go+ device, the data processing starts, but it never gets completed.

You can also access the log file from the log folder in the service path folder to check the following error message:

```
Exception occured while processing the request Year, Month, and Day
parameters describe an un-representable DateTime.
```

Cause

Using the Thickness Monitoring module, when you collected data with the DMS Go+ device and held the **Send** button for more than two seconds, the device also stored an A-Scan reading. The Thickness Monitoring Datalogger interface was unable to process this file or display the readings.

Solution

Follow the instructions in KBA 000034204.

Note:

This issue is applicable only for DMS Go/Go+ devices.

Chapter

9

Data Loaders

Topics:

About the Thickness Monitoring (TM) Data Loaders

The following Data Loaders are available in Thickness Monitoring:

- Thickness Monitoring (TM) Equipment Data Loader
- Thickness Monitoring (TM) Functional Location Data Loader

Throughout the documentation, these Data Loaders are collectively called the Thickness Monitoring (TM) Data Loaders. You can use them to implement Thickness Monitoring when you have thickness measurement data in a legacy system. To import data using these Data Loaders, GE Digital APM provides the following Excel templates:

- Thickness Monitoring (TM) Equipment.xlsx
- Thickness Monitoring (TM) Functional Location.xlsx

These templates support baseline Thickness Monitoring in GE Digital APM. You must export measurement data from your legacy system so that the data can be used to populate the templates. The data from the templates will then be imported into GE Digital APM using the corresponding Data Loaders.

Note: The Excel templates are referred to throughout this documentation as the data loader workbooks.

The data loader workbooks allow you to:

- Create or update Corrosion Analysis Settings (CAS) records for an Asset (i.e., Equipment or Functional Location), TML Group, or TML.
- Create or update TML Group records, and link each of them to an Asset.
- Create or update TML records, and link each of them to an Asset or TML Group.
- Create or update Thickness Measurement records, and link them to a TML.

About the Thickness Monitoring (TM) Data Loaders Requirements

Before you use the data loader workbooks, you must complete the following steps:

- Ensure that the Thickness Monitoring module is deployed.
- Ensure that the following licenses are active:
    - APM Connect Plus
    - Thickness Monitoring
- Ensure that the following data is present:
    - Site Reference
    - Equipment Taxonomy
    - Equipment and Functional Location Families
    - Units of Measure Conversion Sets
    - Stress Tables (GE Digital APM provides Stress Tables for Piping, Pressure Vessels, and Tanks. If you want to use values from these Stress Tables with the data loader workbook, you must ensure that the records are imported into your database prior to performing the data load).
- Ensure that you have set up appropriate relationships and key fields. To do so, you must login as a member of the MI Thickness Monitoring Administrator Security Group.
- Create a relationship between TML Groups and Assets. To do so, configure family preferences, specifying the following values:
    - Asset-to-Subcomponent Relationship: Has TML Group

    ◦ Subcomponent-to-Asset Relationship: Has TML Group
    ◦ Component ID Field: TML Group ID

Note: By default, the relationship is created between Equipment and TML Groups. If you want to use the Thickness Monitoring (TM) Functional Location Data Loader, in the drop-down list box at the top of the workspace, select **Functional Location**.

- The Security User loading the data must be associated with either the MI Data Loader User or MI Data Loader Admin Security Role, and must also be associated with the MI Thickness Monitoring Administrator or the MI Thickness Monitoring Inspector Security Group or a Security Role that is associated with at least one of these Security Groups.
- The data loader workbooks contain sample data in each column. It is only for your reference. You must remove this data before using the data loader workbooks.

About the Thickness Monitoring (TM) Data Loaders Data Model

The Thickness Monitoring (TM) Data Loaders do not load the entire data model illustrated in the normal help documentation. The following data model illustrates which records the Data Loaders support. Assets (i.e., Equipment or Functional Location records), illustrated in green, must exist prior to importing data.
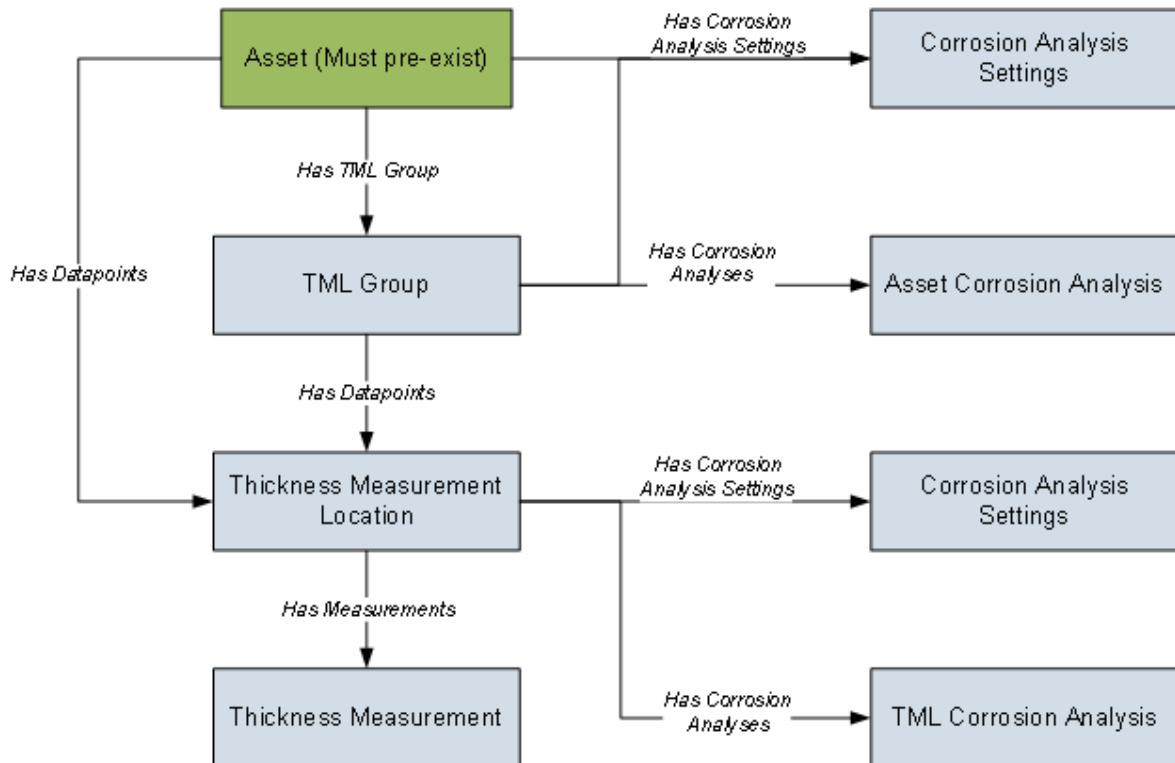
About the Thickness Monitoring (TM) Data Loaders General Loading Strategy

This topic describes the best practices to loading the data and the order in which the data will be loaded.

Best Practices

- For Oracle databases, valid cell values are case-sensitive.

- The imported data must load in a specific sequence in order to successfully populate fields, to create records, and to link them to the predecessor and successor records.
- If a data loader worksheet contains any blank cells:

  ◦ When you create new records, the fields corresponding to the blank cells are updated with the default values, if any.
  ◦ When you update existing records, the fields corresponding to the blank cells are not updated.

- The Thickness Monitoring (TM) Data Loaders map the datasheet columns in the data loader workbooks to fields in GE Digital APM families by their position. Therefore, you must not change the column positions and IDs. You can, however, change the captions if needed.
- ID fields must not include special characters or spaces.
- Columns (including columns representing custom fields) in the worksheets should be formatted as Text.
- You must consider the rules described in the Workbook Layout and Use section of this document while using the data loader workbooks.
- Details related to an Equipment that is linked to a TML Group or a TML must always be entered on the assets and Asset_CAS worksheets of the Thickness Monitoring (TM) Equipment Data Loader even if the asset has already been loaded earlier. Similarly, details related to a Functional Location that is linked to a TML Group or a TML must always be entered on the Functional_Location and Functional_Location_CAS worksheets of the Thickness Monitoring (TM) Functional Location Data Loader even if the Functional Location has already been loaded earlier.
- In addition to the fields included in the data loader workbooks, if you want to add values for more fields for a record, you can add columns for those fields on the appropriate worksheet.

  Note: The fields that you want to add to the data loader workbooks must already exist in the corresponding family. If not, you must add the fields to the family via Configuration Manager.

- Do not delete a worksheet in the data loader workbooks.

Load Sequence

The data must be loaded in the following sequence to successfully populate fields, create records, and link them to the predecessor and successor records:

1. The Assets or the Functional_Location worksheet is processed.

   If you are using the Thickness Monitoring (TM) Equipment Data Loader, it searches for the Equipment that corresponds to the Equipment ID, CMMS System, and Equipment Technical Number information that you provide on the Assets worksheet. If you are using the Thickness Monitoring (TM) Functional Location Data Loader, it searches for the Functional Location that corresponds to the Functional Location ID and CMMS System information that you provide on the Functional_Location worksheet.

   If an asset specified on the worksheet does not exist, it will not be loaded. In addition, the TML Groups and TMLs linked to the asset are not loaded.

2. The Asset_CAS or the Functional_Location_CAS worksheet is processed.

   If you have entered values in all the mandatory cells and if the details of an asset on this worksheet match the details on the Assets or the Functional_Location worksheet:

   - A Corrosion Analysis Settings record is created and linked to the asset using the Has Corrosion Analysis Settings relationship.
   - An Asset Corrosion Analysis record is created and linked to the asset using the Has Corrosion Analyses relationship.

   If you do not enter values (in cells other than the mandatory ones) on this worksheet, the default values are used.

3. The TML_Group worksheet is processed. For each TML Group, if the details of the asset on the TML_Group worksheet match the details on the assets or the Functional_Location worksheet, a TML Group record is created and linked to the asset using the Has TML Group relationship.

4. The TML_Group_CAS worksheet is processed. For each TML Group:

   - A Corrosion Analysis Settings record is created, and linked to the TML Group using the Has Corrosion Analysis Settings relationship. The fields in the Corrosion Analysis Settings record are populated with the corresponding values on the Asset_CAS or the Functional_Location_CAS worksheet.
   - If you have entered values on the TML_Group_CAS worksheet, the values in the fields in the Corrosion Analysis Settings record linked to the TML Group are replaced with the values on the TML_Group_CAS worksheet.
   - An Asset Corrosion Analysis record is created, and linked to the TML Group using the Has Corrosion Analyses relationship.

5. The TML worksheet is processed.

   - If you have entered a value in the TML Group ID column on this worksheet, a Thickness Measurement Location is created and linked to the TML Group using the Has DataPoints relationship. Otherwise, the TML is linked to the asset that you have specified on this worksheet.

6. The TML_CAS worksheet is processed. For each TML:

   - A Corrosion Analysis Settings record is created, and linked to the TML using the Has Corrosion Analysis Settings relationship. The fields in the Corrosion Analysis Settings record are populated with the corresponding values on the TML_Group_CAS, Asset_CAS, or Functional_Location_CAS worksheet, depending on whether the TML is linked to a TML Group, Equipment, or Functional Location respectively.
   - A TML Corrosion Analysis record is created, and linked to the TML using the Has Corrosion Analyses relationship.
   - If you have entered values on this worksheet, the values in the fields in the Corrosion Analysis Settings record linked to the TML are replaced with the values on the TML_CAS worksheet.

7. The Measurements worksheet is processed. For each row on this worksheet, a Thickness Measurement record is created (or updated), and linked to the TML using the Has Measurements relationship.

   Note: For a given TML, if two or more rows contain the same value in the Measurement Date field, then only one Measurement record is created. The fields in that record are populated with values in the last row among them.

After you load the data, the updated assets appear in the **Assets** and **Assets Requiring a Calculation** sections on the **Thickness Monitoring Overview** page. You must calculate all the analyses that you have loaded because they are not calculated automatically after you load the data.

Note: The data loaders used in TM split large amount of data into the following transaction scopes:

- Asset Level Data
- TML Groups in 100-count batches
- Thickness Measurement Locations in 100-count batches
- Measurements in 250-count batches

If an error occurs while loading data, you can reduce the transaction scopes as per your requirement. For information on modifying the transaction scopes, refer to the Configure Data Loader Transaction Scopes topic.

About the Thickness Monitoring (TM) Data Loaders Workbook Layout and Use

Color Coding

Certain columns on the worksheets have different functions and requirements. To illustrate this, certain columns are color-coded. The following table lists the colors and what they represent.

Color	Description	Comments
Grey	Lookup Fields	Indicates columns that contain values that are used by the Thickness Monitoring Data Loader to look up and create records. If these columns are removed from the worksheets, the data load will fail. While the worksheets require that these columns be present, values are not necessarily required in these columns.
Red	Fields Required for Calculation	Indicates columns that contain values that are required to perform calculations in Risk Based Inspection. Some cells only require values in certain cases. Such cases are found in parentheses in the first row of each worksheet.
Blue	Recommended Fields	Indicates columns that, according to GE Digital APM Best Practice for Risk Based Inspection, should contain values.
Green	Custom Fields	Indicates columns where you can specify custom fields.

Limitations

The Thickness Monitoring (TM) Data Loaders have the following limitations:

- If you modify the format of the values in columns on any of the worksheets, you will not be able to import data.
- You cannot create or update nominal measurements using the data loader workbooks. You can only create or update actual measurements.
- The values that you enter in the data loader workbooks are case-sensitive.
- You cannot link an RBI Component to a TML Group using the data loader workbooks.
- You cannot relocate, renew, or organize TMLs using the data loader workbooks.
- You cannot skip measurements using the data loader workbooks.
- If you reimport data, the records that have been created by the Thickness Monitoring (TM) Data Loaders will be updated. Therefore, while reimporting data related to a record, if you remove the data for a field in the data loader workbooks, the value for the corresponding field in GE Digital APM will be either a default value or blank.

  Tip: If you do not want to update a field value, you can remove the corresponding column from the data loader workbooks. You cannot, however, remove columns that correspond to required fields.

Assets Worksheet

On the Assets worksheet, you will specify Equipment to which you want to link Thickness Measurement Locations (TMLs) and TML Groups. This worksheet is included only in the Thickness Monitoring (TM) Equipment Data Loader. The columns that appear on this worksheet also appear on every subsequent worksheet in the Thickness Monitoring (TM) Equipment Data Loader. They are used to identify the records that will be linked, directly or indirectly, to the Equipment. The combination of values in the three columns on this worksheet must be unique.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment record for an asset has a value in the CMMS System field, enter that value in this column.
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_N BR_C	Character (255)	If you are required to enter a value for the CMMS System cell for a piece of equipment, and the Equipment record has a value in the Equipment Technical Number field, enter that value in this column. If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field.

Functional_Location Worksheet

On the Functional_Location worksheet, you will specify Functional Locations to which you want to link Thickness Measurement Locations (TMLs) and TML Groups. This worksheet is included only in the Thickness Monitoring (TM) Functional Location Data Loader. The columns that appear on this worksheet also appear on every subsequent worksheet in the Thickness Monitoring (TM) Functional Location Data Loader. They are used to identify the records that will be linked, directly or indirectly, to the Functional Locations. The combination of values in the two columns on this worksheet must be unique.

Field Caption	Field ID	Data Type (Length)	Comments
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value.
CMMS System	MI_FNCLOC00_SAP_SYSTEM_C	Character (255)	If the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.

Asset_CAS Worksheet

On the Asset_CAS worksheet, you will specify Corrosion Analysis Settings records for an Equipment. If you do not enter values on this worksheet, the default values are used. This worksheet is included only in the Thickness Monitoring (TM) Equipment Data Loader.

In addition, the values that you enter on this worksheet are used to specify Corrosion Analysis Settings for associated TML Groups and TMLs. You can, however, overwrite these values by specifying different values on the TML_Group_CAS and TML_CAS worksheets respectively.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment record for an asset has a value in the CMMS System field, enter that value in this column.
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_NBR_C	Character (255)	If you are required to enter a value for the CMMS System cell for an asset, and the Equipment record for the asset has a value in the Equipment Technical Number field, enter that value in this column. If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field.

Field Caption	Field ID	Data Type (Length)	Comments
Inspection Type	MI_CA_SET_ANALY_TYPE_CHR	Character (50)	If you do not enter a value in this cell, then data in this row is not loaded. In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs: **System Code ID** / **Inspection Type** UT / Ultrasonic Thickness RT / Radiographic Thickness TML / Thickness Measurement Location The list in this field is populated by the CITP System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.
Controlling Corrosion Rate	MI_CA_SET_CR_ROLL_OPT_CHR	Character (50)	This cell may only contain one of the following values: • Average • Formula • Maximum The default value is Maximum.
Comments	MI_CA_SET_COM_CON_COR_RAT_CHR	Character (2500)	None
Apply CCR to TML Rem Life Next Insp Date Calc	MI_CA_SET_APPLY_CR_FLG	Boolean	Enter True or False. The default value is False.
Safety Factor	MI_CA_SET_AVG_CR_SFTY_FCTR_NBR	Numeric	The default value is 1.
Minimum Number of TMLs	MI_CA_SET_AVG_CR_MN_TML_NBR	Numeric	The default value is 1.
Percentile	MI_CA_SET_AVG_CR_PERC_NBR	Numeric	The default value is 100.

Field Caption	Field ID	Data Type (Length)	Comments
Std Deviation Factor	MI_CA_SET_STD_DEV_FCTR_NBR	Numeric	The default value is 2.
Remaining Life Critical Number of TMLs	MI_CA_SET_RM_LIF_CRIT_TMLS_NBR	Numeric	The default value is 1. Enter a value between 0 and 1.
Corrosion Rate Options - Least Squares	MI_CA_SET_CR_OPT_LS_FLG	Boolean	Enter True or False. The default value is False.
Corrosion Rate Options - Short Term	MI_CA_SET_CR_OPT_ST_FLG	Boolean	Enter True or False. The default value is True.
Corrosion Rate Options - Long Term	MI_CA_SET_CR_OPT_LT_FLG	Boolean	Enter True or False. The default value is True.
Corrosion Rate Options - Custom A	MI_CA_SET_CR_OPT_A_F	Boolean	Enter True or False. The default value is False.
Corrosion Rate Options - Custom B	MI_CA_SET_CR_OPT_B_F	Boolean	Enter True or False. The default value is False.
Default Inspection Interval (Months)	MI_CA_SET_INSP_INTRVL_NBR	Numeric	The default value is 0.
Inspection Interval Options - Factor Remaining Life	MI_CA_SET_INSP_INT_OPT_FRL_FLG	Boolean	Enter True or False. The default value is True.
Inspection Interval Options - Inspection Interval	MI_CA_SET_INSP_INT_OPT_II_FLG	Boolean	Enter True or False. The default value is True.
Default T-Min (Inches)	MI_CA_SET_REF_TMIN_NBR	Numeric	The default value is 0.
Minimum Corrosion Rate (Mils/year)	MI_CA_SET_MN_CR_NBR	Numeric	The default value is 5.
Use Minimum Corrosion Rate	MI_CA_SET_USE_MN_CR_FLG	Boolean	Enter True or False. The default value is False.
Remaining Life Factor	MI_CA_SET_REM_LIFE_FCTR_NBR	Numeric	The default value is 0.5. Enter a number between 0 and 1.
Allowable Measurement Variance (inches)	MI_CA_SET_ALLOW_VARIA_NBR	Numeric	The default value is 0.
Corrosion Rate Variance	MI_CA_SET_CRV_N	Numeric	The default value is 0.

Functional_Location_CAS Worksheet

On the Functional_Location_CAS worksheet, you will specify Corrosion Analysis Settings records for a Functional Location. If you do not enter values on this worksheet, the default values are used. This worksheet is included only in the Thickness Monitoring (TM) Functional Location Data Loader.

In addition, the values that you enter on this worksheet are used to specify Corrosion Analysis Settings for associated TML Groups and TMLs. You can, however, overwrite these values by specifying different values on the TML_Group_CAS and TML_CAS worksheets respectively.

Field Caption	Field ID	Data Type (Length)	Comments
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value.
CMMS System	MI_FNCLOC00_SAP_SYSTEM_C	Character (255)	If the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.
Inspection Type	MI_CA_SET_ANALY_TYPE_CHR	Character (50)	If you do not enter a value in this cell, then data in this row is not loaded. In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs: **System Code ID / Inspection Type** UT — Ultrasonic Thickness RT — Radiographic Thickness TML — Thickness Measurement Location The list in this field is populated by the CITP System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.
Controlling Corrosion Rate	MI_CA_SET_CR_ROLL_OPT_CHR	Character (50)	This cell may only contain one of the following values: • Average • Formula • Maximum The default value is Maximum.
Comments	MI_CA_SET_COM_CON_COR_RAT_CHR	Character (2500)	None

Field Caption	Field ID	Data Type (Length)	Comments
Apply CCR to TML Rem Life Next Insp Date Calc	MI_CA_SET_APPLY_CR_FLG	Boolean	Enter True or False. The default value is False.
Safety Factor	MI_CA_SET_AVG_CR_SFTY_FCTR_NBR	Numeric	The default value is 1.
Minimum Number of TMLs	MI_CA_SET_AVG_CR_MN_TML_NBR	Numeric	The default value is 1.
Percentile	MI_CA_SET_AVG_CR_PERC_NBR	Numeric	The default value is 100.
Std Deviation Factor	MI_CA_SET_STD_DEV_FCTR_NBR	Numeric	The default value is 2.
Remaining Life Critical Number of TMLs	MI_CA_SET_RM_LIF_CRIT_TMLS_NBR	Numeric	The default value is 1.
Corrosion Rate Options - Least Squares	MI_CA_SET_CR_OPT_LS_FLG	Boolean	Enter True or False. The default value is False.
Corrosion Rate Options - Short Term	MI_CA_SET_CR_OPT_ST_FLG	Boolean	Enter True or False. The default value is True.
Corrosion Rate Options - Long Term	MI_CA_SET_CR_OPT_LT_FLG	Boolean	Enter True or False. The default value is True.
Corrosion Rate Options - Custom A	MI_CA_SET_CR_OPT_A_F	Boolean	Enter True or False. The default value is False.
Corrosion Rate Options - Custom B	MI_CA_SET_CR_OPT_B_F	Boolean	Enter True or False. The default value is False.
Default Inspection Interval (Months)	MI_CA_SET_INSP_INTRVL_NBR	Numeric	The default value is 0.
Inspection Interval Options - Factor Remaining Life	MI_CA_SET_INSP_INT_OPT_FRL_FLG	Boolean	Enter True or False. The default value is True.
Inspection Interval Options - Inspection Interval	MI_CA_SET_INSP_INT_OPT_II_FLG	Boolean	Enter True or False. The default value is True.
Default T-Min (Inches)	MI_CA_SET_REF_TMIN_NBR	Numeric	The default value is 0.
Minimum Corrosion Rate (Mils/year)	MI_CA_SET_MN_CR_NBR	Numeric	The default value is 5.
Use Minimum Corrosion Rate	MI_CA_SET_USE_MN_CR_FLG	Boolean	Enter True or False. The default value is False.
Remaining Life Factor	MI_CA_SET_REM_LIFE_FCTR_NBR	Numeric	The default value is 0.5. Enter a number between 0 and 1.
Allowable Measurement Variance (inches)	MI_CA_SET_ALLOW_VARIA_NBR	Numeric	The default value is 0.
Corrosion Rate Variance	MI_CA_SET_CRV_N	Numeric	The default value is 0.

TML_Group Worksheet

On the TML_Group worksheet, you will specify the TML groups (which are or will be represented by TML Group records) that you want to create or update.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Equipment Data Loader.
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Functional Location Data Loader.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment or the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_NBR_C	Character (255)	This column appears only in the Thickness Monitoring (TM) Equipment Data Loader. If you are required to enter a value for the CMMS System cell for an asset, and the Equipment record for the asset has a value in the Equipment Technical Number field, enter that value in this column. If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field.
TML Group ID	MI_TMLGROUP_ID_C	Character (50)	A value is required and must be unique among all the TML Groups linked to an Asset. **Note:** Although the TML Group ID field is disabled and populated automatically in GE Digital APM, you can override the value using the data loader workbook.
Description	MI_TMLGROUP_DESCR_C	Character (255)	None

Field Caption	Field ID	Data Type (Length)	Comments
Corrosion Group	MI_TMLGROUP_CORRO_GROUP_C	Character (255)	None
Comments	MI_TMLGROUP_COMME_T	Character (2500)	None

TML_Group_CAS

On the TML_Group_CAS worksheet, you will specify Corrosion Analysis Settings records for a TML Group. If you do not enter values on this worksheet, the values on the Asset_CAS or Functional_Location_CAS worksheet for the associated asset are used. Otherwise, the values that you enter on the TML_Group_CAS are used for the TML Group.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Equipment Data Loader.
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Functional Location Data Loader.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment or the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_NBR_C	Character (255)	This column appears only in the Thickness Monitoring (TM) Equipment Data Loader. If you are required to enter a value for the CMMS System cell for an asset, and the Equipment record for the asset has a value in the Equipment Technical Number field, enter that value in this column.

If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field. |

Field Caption	Field ID	Data Type (Length)	Comments
Inspection Type	MI_CA_SET_ANALY_TYPE_CHR	Character (50)	If you do not enter a value in this cell, then data in this row is not loaded. This cell may only contain a value that you entered in the Inspection Type cell for the associated asset on the Asset_CAS or Functional_Location_CAS worksheet.
TML Group ID	MI_TMLGROUP_ID_C	Character (50)	A value is required and must match one of the value in the corresponding cell on the TML Group worksheet.
Controlling Corrosion Rate	MI_CA_SET_CR_ROLL_OPT_CHR	Character (50)	This cell may only contain one of the following values: • Average • Formula • Maximum
Comments	MI_CA_SET_COM_CON_COR_RAT_CHR	Character (2000)	None
Apply CCR to TML Rem Life Next Insp Date Calc	MI_CA_SET_APPLY_CR_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.
Safety Factor	MI_CA_SET_AVG_CR_SFTY_FCTR_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.
Minimum Number of TMLs	MI_CA_SET_AVG_CR_MN_TML_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.
Percentile	MI_CA_SET_AVG_CR_PERC_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.

Field Caption	Field ID	Data Type (Length)	Comments
Std Deviation Factor	MI_CA_SET_STD_DEV_FCTR_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Remaining Life Critical Number of TMLs	MI_CA_SET_RM_LIF_CRIT_TMLS_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Corrosion Rate Options - Least Squares	MI_CA_SET_CR_OPT_LS_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Corrosion Rate Options - Short Term	MI_CA_SET_CR_OPT_ST_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Corrosion Rate Options - Long Term	MI_CA_SET_CR_OPT_LT_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Corrosion Rate Options - Custom A	MI_CA_SET_CR_OPT_A_F	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.

Field Caption	Field ID	Data Type (Length)	Comments
Corrosion Rate Options - Custom B	MI_CA_SET_CR_OPT_B_F	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Default Inspection Interval (Months)	MI_CA_SET_INSP_INTRVL_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Inspection Interval Options - Factor Remaining Life	MI_CA_SET_INSP_INT_OPT_FRL_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Inspection Interval Options - Inspection Interval	MI_CA_SET_INSP_INT_OPT_II_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Default T-Min (Inches)	MI_CA_SET_REF_TMIN_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Minimum Corrosion Rate (Mils/year)	MI_CA_SET_MN_CR_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.

Field Caption	Field ID	Data Type (Length)	Comments
Use Minimum Corrosion Rate	MI_CA_SET_USE_MN_CR_FLG	Boolean	Enter True or False. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Remaining Life Factor	MI_CA_SET_REM_LIFE_FCTR_NBR	Numeric	Enter a number between 0 and 1. If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Allowable Measurement Variance (inches)	MI_CA_SET_ALLOW_VARIA_NBR	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.
Corrosion Rate Variance	MI_CA_SET_CRV_N	Numeric	If you do not enter a value in this cell, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS work sheet is used.

TML Worksheet

On the TML worksheet, you will specify the TMLs (that are or will be represented by Thickness Measurement Location records) that you want to create. For some of the cells, if you do not enter a value on this worksheet, after you load data, the corresponding fields are populated automatically in GE Digital APM.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Equipment Data Loader.
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Functional Location Data Loader.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment or the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_N BR_C	Character (255)	This column appears only in the Thickness Monitoring (TM) Equipment Data Loader. If you are required to enter a value for the CMMS System cell for an asset, and the Equipment record for the asset has a value in the Equipment Technical Number field, enter that value in this column. If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field.
TML Group ID	MI_TMLGROUP_ID_C	Character (50)	If you do not enter a value in this cell, the TML is directly linked to the Asset.
TML ID	MI_DP_ID_CHR	Character (50)	A value is required, and must be unique among all the TMLs linked to a TML Group or an Asset.
TML Analysis Type	MI_TML_TYPE_CHR	Character (50)	A value is required. This cell may only contain one of the values that you entered in the Inspection Type cell in the Asset_CAS, Functional_Location_CAS, or TML_Group_CAS worksheet, whichever is linked to the TML.

Field Caption	Field ID	Data Type (Length)	Comments
Component Type	MI_TML_COMP_TYPE_CHR	Character (10)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs: • Piping • Pressure Vessel • Tank
Location	MI_DP_LOCTN_CHR	Character (50)	None
ISO Drawing Number	MI_DP_ISO_DRAW_CHR	Character (50)	None
Access	MI_DP_ACCESS_CHR	Character (50)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs: • LADDER • MANLIFT • SCAFFOLD The list in this field is populated by the DPAC System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.
Inspection Sequence Number	MI_DP_INSP_SEQ_NBR	Numeric	None
Insulated Flag	MI_TML_INSLTED_FLG	Boolean	Enter True or False. The default value is False.
TML Comment	MI_DP_COMMNT_CHR	Character (255)	None
Minimum Thickness	MI_TML_MIN_THICK_NBR	Numeric	If you do not enter a value in this cell, the value in the Default T-Min (Inches) cell on the TML_CAS worksheet is used.
Additional Thickness	MI_THICK_MEASU_LOCAT_ADDIT_THI	Numeric	None
Excluded From Analysis	MI_DP_EXCL_FROM_ANALYSIS_FLG	Logical	Enter True or False. The default value is False.
Number of Readings	MI_TML_READ_NUM_N	Numeric	Enter a number between 1 and 26. The default value is 1.

Field Caption	Field ID	Data Type (Length)	Comments
Design Code	MI_TML_DSGN_CODE_CHR	Character (50)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs based on the value in the Component Type cell: **Component Type / Design Code:** Piping — B31.1, B31.3 Pressure Vessel — ASME VIII DIV 1 Tank — API 653 The list in this field is populated by the DSCD System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.
Code Year (T-Min Formula)	MI_TML_CODE_YEAR_C	Character (4)	A value is required if the value in the Design Code cell is not N/A. This cell may only contains one of the following values: • N/A • 1995

Field Caption	Field ID	Data Type (Length)	Comments
Code Year (Allowable Stress Lookup)	MI_TML_CODE_YEAR_STRESS_C	Character (4)	A value is required if the value in the Design Code cell is not N/A. The following table provides the valid values that you can enter in this cell based on the value in the Design Code cell. | Design Code	Code Year (Allowable Stress Lookup)
---	---
API 653	2008
ASME VIII DIV 1	1998 / 2010
B31.1	2014
B31.3	2014	
Material Specification	MI_TML_MAT_SPEC_CHR	Character	A value is required if the value in the Override Allowable Stress cell is False, and if you want GE Digital APM to calculate T-min values. Refer to the (Picklist) worksheet in the data loader workbook for valid values that you can enter in this cell based on the values in the Design Code and Code Year (Allowable Stress Lookup) cells.
Material Grade	MI_TML_MAT_GRADE_CHR	Character (50)	A value is required if the value in the Override Allowable Stress cell is False, and if you want GE Digital APM to calculate T-min values. Refer to the (Picklist) worksheet in the data loader workbook for valid values that you can enter in this cell based on the values in the Design Code, Code Year (Allowable Stress Lookup), and Material Specification cells.
Material Type	MI_TML_MATER_TYPE_CHR	Character	None
Design Pressure	MI_TML_DSGN_PRESS_NBR	Numeric	A value is required if you want GE Digital APM to calculate T-min values.

Field Caption	Field ID	Data Type (Length)	Comments
Design Temperature	MI_TML_DSGN_TEMP_NBR	Numeric	A value is required if you want GE Digital APM to calculate T-min values.
Nominal Thickness	MI_TML_NOM_THICK_NBR	Numeric	None
Override Allowable Stress	MI_TML_OVRD_ALLOW_STRES_F	Boolean	Enter True or False.
Allowable Stress	MI_TML_ALLOWABLE_STRESS_N	Numeric	A value is required if the value in the Override Allowable Stress cell is True, and you want GE Digital APM to calculate T-min values.
Outside Diameter	MI_TML_OUTSD_DIAM_NBR	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Vessel Type cell is CON_HEAD (Conical Head), ELLIP_HEAD (Ellipsoidal Head), PIPENOZZ (Pipe nozzle),TORCC_HEAD (Toriconical Head), or TORCK_HEAD (Toriconical Head, Knuckle Portion). • The value in the PV Formula cell is Outside. • You want GE Digital APM to calculate T-min values.
Inside Diameter	MI_TML_INSD_DIAM_NBR	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Vessel Type cell is CON_HEAD (Conical Head), ELLIP_HEAD (Ellipsoidal Head), TORCC_HEAD (Toriconical Head), or TORCK_HEAD (Toriconical Head, Knuckle Portion). • The value in the PV Formula cell is Inside. • You want GE Digital APM to calculate T-min values.

Field Caption	Field ID	Data Type (Length)	Comments
Joint Factor	MI_TML_JOINT_EFF_NBR	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is RIVSHELL (Rivited Shell) or WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values. The default value is 1.
Corrosion Allowance	MI_TML_CORR_ALLOW_NBR	Numeric	None
Piping Nominal Diameter - NPS	MI_TML_NOM_DIAM_NBR	Numeric	Refer to the (Picklist) worksheet in the data loader workbook for a list of values that you can enter in this cell. The values in the Piping Nominal Diameter - NPS and Piping Nominal Diameter - DN cells are mapped using the Piping Properties reference table. Therefore, if you enter a value in one of these cells, the other field is populated with the mapped value after you load data. If you enter a value that is not mapped to the value in the Piping Nominal Diameter - DN cell, then the value in this cell is ignored, and the corresponding field is populated with the value mapped to the value in the Piping Nominal Diameter - DN cell. For example, if the value in the Piping Nominal Diameter - DN cell is 6, then the value in this cell must be 0.125. If you enter a different value in this cell or leave it blank, then the value 0.125 is used to populate the corresponding field in GE Digital APM.

Field Caption	Field ID	Data Type (Length)	Comments
Piping Nominal Diameter - DN	MI_TML_PIPING_NOM_DIAM_DN_N	Numeric	Refer to the (Picklist) worksheet in the data loader workbook for a list of values that you can enter in this cell. The values in the Piping Nominal Diameter - NPS and Piping Nominal Diameter - DN cells are mapped using the Piping Properties reference table. Therefore, if you enter a value in one of these cells, the other field is populated with the mapped value after you load data.
Schedule	MI_TML_SCHED_CHR	Character (50)	A value is required if you have entered a value in the Piping Nominal Diameter - NPS cell. Refer to the (Picklist) worksheet in the data loader workbook for a list of values that you can enter in this cell based on the value in the Piping Nominal Diameter - NPS cell.

Field Caption	Field ID	Data Type (Length)	Comments
Piping Formula	MI_TML_PIPING_FORMULA_C	Character (4)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs based on the values in the Design Code cell:

Design Code	Piping Formula
No value	A B C D
B31.3	A B C D
Any value other than B31.3	N/A

The list in this field is populated by the PIPFMU System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.

Field Caption	Field ID	Data Type (Length)	Comments
Mechanical Allowance	MI_TML_MECH_ALLOWANCE_N	Numeric	The default value is 0.
Design Factor	MI_TML_DESIGN_FACTOR_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Component Type cell is Piping. • The value in the Design Code cell is B31.8. • You want GE Digital APM to calculate T-min values. The default value is 1.

Field Caption	Field ID	Data Type (Length)	Comments
Temperature Factor	MI_TML_TEMP_FACTOR_N	Numeric	A value is required if the value in the Component Type cell is Piping, and if you want GE Digital APM to calculate T-min values. The default value is 1.
Tank Type	MI_TML_TANK_TYPE_C	Character (50)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs: | System Code ID	Tank Type
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ANNRING	Annular Ring
FLRPLATE	Floor Plate
RIVSHELL	Rivited Shell
ROOFPLATE	Roof Plate
WELDSHELL	Welded Shell	 The list in this field is populated by the TNKT System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.
Shell Type	MI_TML_SHELL_TYPE_C	Character (50)	None
API Method	MI_TML_API_METHOD_C	Character (50)	None
Plate Thickness	MI_TML_PLATE_THICKNESS_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is ANNRING (Annular Ring). • You want GE Digital APM to calculate T-min values.

Field Caption	Field ID	Data Type (Length)	Comments
Minimum Yield Strength	MI_TML_MIN_YIELD_STR_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values.
Minimum Tensile Strength	MI_TML_MIN_TENSILE_STR_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values.
Course Height	MI_TML_COURSE_HEIGHT_N	Numeric	None
Course Number	MI_TML_COURSE_NUMBER_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values.
Fill Height	MI_TML_FILL_HEIGHT_N	Numeric	None
Specific Gravity	MI_TML_SPECIFIC_GRAVITY_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is ANNRING (Annular Ring), RIVSHELL (Rivited Shell), or WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values.

Field Caption	Field ID	Data Type (Length)	Comments
Floor Plate has Detection?	MI_TML_FLR_PLATE_DETECTION_L	Boolean	Enter True or False. The default value is False.
Floor Plate has Reinforced Lining?	MI_TML_FLR_PLATE_REINFORCED_LINING_L	Boolean	Enter True or False. The default value is False.
Maximum Operating Fill Height	MI_TML_MAX_OP_FILL_HEIGHT_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is ANNRING (Annular Ring), RIVSHELL (Rivited Shell), or WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values.
Distance From the Bottom	MI_TML_DIST_FROM_BOTT_NBR	Numeric	None
Tank Diameter	MI_TML_TANK_DIAMETER_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Design Code cell is API 653. • The value in the Tank Type cell is ANNRING (Annular Ring), RIVSHELL (Rivited Shell), or WELDSHELL (Welded Shell). • You want GE Digital APM to calculate T-min values.

Field Caption	Field ID	Data Type (Length)	Comments
Vessel Type	MI_TML_VESSEL_TYPE_C	Character (50)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs:

System Code ID	Tank Type
CON_HEAD	Conical Head
CYL_SHELL	Cylindrical Shell
ELLIP_HEAD	Ellipsoidal Head
HEM_HEAD	Hemispherical Head
PIPENOZZ	Pipe Nozzle
SPH_SHELL	Spherical Shell
TORCC_HEAD	Toriconical Head
TORCK_HEAD	Toriconical Head, Knuckle Portion
TORSP_HEAD	Torispherical Head

The list in this field is populated by the VSTP System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.

Field Caption	Field ID	Data Type (Length)	Comments
PV Formula	MI_TML_PV_FORMULA_C	Character (10)	In the baseline GE Digital APM system, this cell may only contain one of the following System Code IDs: • Inside • Outside The list in this field is populated by the PVFMU System Code Table. If the system code table has been customized, the valid values could be different. To verify which options are acceptable in your GE Digital APM system, via Configuration Manager, refer to the appropriate table.
Dish Radius	MI_TML_DISH_RADIUS_N	Numeric	A value is required if: • The value in the Vessel Type cell is TORSP_HEAD (Torispherical Head). -and- • You want GE Digital APM to calculate T-min values.
Knuckle Radius	MI_TML_KNUCKLE_RADIUS_N	Numeric	A value is required if: • The value in the Vessel Type cell is TORCK_HEAD (Toriconical Head, Knuckle Portion) or TORSP_HEAD (Torispherical Head). -and- • You want GE Digital APM to calculate T-min values.
apex_angle	MI_TML_APEX_ANGLE_N	Numeric	A value is required if: • The value in the Vessel Type cell is CON_HEAD (Conical Head), TORCC_HEAD Toriconical Head), or TORCK_HEAD (Toriconical Head, Knuckle Portion). -and- • You want GE Digital APM to calculate T-min values.

Field Caption	Field ID	Data Type (Length)	Comments
Inside Radius	MI_TML_INSIDE_RADIUS_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Vessel Type cell is CYL_SHELL (Cylindrical Shell), HEM_HEAD Hemispherical Head), or SPH_SHELL (Spherical Shell). • The value in the PV Formula cell is Inside. • You want GE Digital APM to calculate T-min values.
Outside Radius	MI_TML_OUTSIDE_RADIUS_N	Numeric	A value is required if all of the following conditions are satisfied: • The value in the Vessel Type cell is CYL_SHELL (Cylindrical Shell), HEM_HEAD Hemispherical Head), or SPH_SHELL (Spherical Shell). • The value in the PV Formula cell is Outside. • You want GE Digital APM to calculate T-min values.
Head Diameter	MI_TML_HEAD_DIAMETER_N	Numeric	None

TML_CAS Worksheet

On the TML_CAS worksheet, you will specify Corrosion Analysis Settings records for a TML.

• If you do not enter values on this worksheet, and:
  ◦ If the TML is linked to a TML Group, then the values on the TML_Group_CAS worksheet for the associated TML Group are used.
  ◦ If the TML is not linked to a TML Group, the values that you enter on the Asset_CAS or Functional_Location_CAS worksheet are used.
• Otherwise, the values on the TML_CAS worksheet are used.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Equipment Data Loader.
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Functional Location Data Loader.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment or the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_N BR_C	Character (255)	This column appears only in the Thickness Monitoring (TM) Equipment Data Loader. If you are required to enter a value for the CMMS System cell for an asset, and the Equipment record for the asset has a value in the Equipment Technical Number field, enter that value in this column. If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field.
Inspection Type	MI_CA_SET_ANALY_TYPE_CHR	Character (50)	If you do not enter a value in this cell, then data in this row is not loaded. If the TML is linked to a TML Group, then this cell may only contain a value that you have entered in the Inspection Type cell for the associated TML Group on the TML_Group_CAS worksheet. Otherwise, this cell may only contain a value that you have entered in the Inspection Type cell for the associated asset on the Asset_CAS worksheet.

Field Caption	Field ID	Data Type (Length)	Comments
TML Group ID	MI_TMLGROUP_ID_C	Character (50)	A value is required if the TML is linked to a TML Group. The value should match the value in the TML Group ID cell for the corresponding TML on the TML worksheet. If you do not enter a value in this cell, the TML is directly linked to the Asset.
TML ID	MI_DP_ID_CHR	Character (50)	A value is required and must be unique.
Std Deviation Factor	MI_CA_SET_STD_DEV_FCTR_NBR	Numeric	If you do not enter a value in this cell, and if the TML is linked to a TML Group, then the value in the corresponding cell on the TML_Group_CAS worksheet is used. Otherwise, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.
Default Inspection Interval (Months)	MI_CA_SET_INSP_INTRVL_NBR	Numeric	If you do not enter a value in this cell, and if the TML is linked to a TML Group, then the value in the corresponding cell on the TML_Group_CAS worksheet is used. Otherwise, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.
Minimum Corrosion Rate (Mils/year)	MI_CA_SET_MN_CR_NBR	Numeric	If you do not enter a value in this cell, and if the TML is linked to a TML Group, then the value in the corresponding cell on the TML_Group_CAS worksheet is used. Otherwise, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.

Field Caption	Field ID	Data Type (Length)	Comments
Allowable Measurement Variance (inches)	MI_CA_SET_ALLOW_VARIA_NBR	Numeric	If you do not enter a value in this cell, and if the TML is linked to a TML Group, then the value in the corresponding cell on the TML_Group_CAS worksheet is used. Otherwise, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.
Corrosion Rate Variance	MI_CA_SET_CRV_N	Numeric	If you do not enter a value in this cell, and if the TML is linked to a TML Group, then the value in the corresponding cell on the TML_Group_CAS worksheet is used. Otherwise, the value in the corresponding cell on the Asset_CAS or the Functional_Location_CAS worksheet is used.

Measurements Worksheet

On the Measurements worksheet, you will specify the TMs (that are or will be represented by Thickness Measurement records) that you want to create or update.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment ID	MI_EQUIP000_EQUIP_ID_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Equipment Data Loader.
Functional Location ID	MI_FNCLOC00_FNC_LOC_C	Character (255)	This column requires at least one cell to have a value. This column appears only in the Thickness Monitoring (TM) Functional Location Data Loader.
CMMS System	MI_EQUIP000_SAP_SYSTEM_C	Character (255)	If the Equipment or the Functional Location record for an asset has a value in the CMMS System field, enter that value in this column.

Field Caption	Field ID	Data Type (Length)	Comments
Equipment Technical Number	MI_EQUIP000_EQUIP_TECH_NBR_C	Character (255)	This column appears only in the Thickness Monitoring (TM) Equipment Data Loader. If you are required to enter a value for the CMMS System cell for an asset, and the Equipment record for the asset has a value in the Equipment Technical Number field, enter that value in this column. If there is no value in the CMMS System field, this column can be blank, even if the Equipment record contains a value for the Equipment Technical Number field.
TML Group ID	MI_TMLGROUP_ID_C	Character (50)	A value is required if the corresponding TML is linked to a TML Group. The value that you enter must match the value in the TML Group ID cell for the corresponding TML on the TML worksheet.
TML ID	MI_DP_ID_CHR	Character (50)	A value is required and should match the value in the TML ID cell for the corresponding TML on the TML worksheet. Otherwise, data in this row is not loaded.
Readings	MI_THICK_MEASU_READI_C	Character (2000)	A value is required. Enter a number greater than 0. If you have multiple readings, separate them with semicolons. If you do not enter a value in this cell, the data in this row is not loaded.
Measurement Date	MI_DP_MEAS_TAKEN_DT	Date	Enter a value in the following format: YYYY-MM-DD hh:mm:ss If you do not enter a value, the current date is used.

Field Caption	Field ID	Data Type (Length)	Comments
Measurement Taken By	MI_DP_MEAS_TAKEN_BY_CHR	Character	Enter a value in the following format: <Last Name>, <First Name> ~ <User ID> When you want to create a Thickness Monitoring record using the data loader workbook, and if your user ID appears in the Measurement Taken By field on a Thickness Measurement datasheet, then you need not enter a value in this cell. The appropriate value is automatically populated in the Measurement Taken By field after you load data. If not, enter a value that matches the user ID of a Security User in GE Digital APM. Otherwise, the data in this row is not loaded. If, however, you do not want the Measurement Taken by field to be populated automatically, using the data loader workbook, update the Thickness Monitoring record by leaving the Measurement Taken By cell blank.
Measurement Comment	MI_DP_MEAS_COMMENT_CHR	Character (255)	None
Temperature	MI_THICK_MEAS_TEMP_TAKEN_AT_N	Numeric	None

About the Thickness Monitoring (TM) Data Loaders Load Verification

About This Task

After you load data, perform the following steps in GE Digital APM to confirm the integrity and accuracy of the data that you have loaded:

Procedure

- Access the details of the import job. These details indicate if any errors were encountered during the data load. The log may help account for any records that are not loaded.
- In Thickness Monitoring or Record Manager, access the assets specified in the data loader workbook, and then verify that the expected TML Groups and TMLs are present or updated, and that any associated records that you expected to be created are also present in the database.

- To view a list of TML Groups created after a specific date, run the following query:

  - For an SQL database:

    ```
    SELECT [MI_TMLGROUP].[MI_TMLGROUP_ID_C] "TML Group ID",
    [MI_TMLGROUP].[MI_TMLGROUP_DESCR_C]
     "Description", [MI_TMLGROUP].LAST_UPDT_DT "LAST_UPDT_DT" FROM
    [MI_TMLGROUP] WHERE
    [MI_TMLGROUP].LAST_UPDT_DT >= CONVERT(VARCHAR(255),
    (? :d :caption='Enter a Date'), 110)
    ```

  - For an Oracle database:

    ```
    SELECT [MI_TMLGROUP].[MI_TMLGROUP_ID_C] "TML Group ID",
    [MI_TMLGROUP].[MI_TMLGROUP_DESCR_C]
     "Description", [MI_TMLGROUP].LAST_UPDT_DT "LAST_UPDT_DT",
    [MI_TMLGROUP].ENTY_ID "ENTY_ID"
    FROM [MI_TMLGROUP] WHERE [MI_TMLGROUP].LAST_UPDT_DT >=
    to_date(to_char((? :d :caption='Enter
    a Date'), 'mm/dd/yyyy'), 'mm/dd/yyyy')
    ```

- To view a list of TMLs created after a specific date, run the following query:

  - For an SQL database:

    ```
    SELECT [MI Thickness Measurement Location].[MI_DP_ID_CHR] "TML
    ID", [MI Thickness Measurement Location].
    [MI_DP_ASSET_ID_CHR] "TML Asset ID", [MI Thickness Measurement
    Location].LAST_UPDT_DT "LAST_UPDT_DT"
    FROM [MI Thickness Measurement Location] WHERE [MI Thickness
    Measurement Location].LAST_UPDT_DT >=
    CONVERT(VARCHAR(255), (? :d :caption='Enter a Date'), 110)
    ```

  - For an Oracle database:

    ```
    SELECT [MI Thickness Measurement Location].[MI_DP_ID_CHR] "TML
    ID", [MI Thickness Measurement Location].
    [MI_DP_ASSET_ID_CHR] "TML Asset ID", [MI Thickness Measurement
    Location].LAST_UPDT_DT "LAST_UPDT_DT",
    [MI Thickness Measurement Location].ENTY_KEY "ENTY_KEY" FROM [MI
    Thickness Measurement Location] WHERE
    [MI Thickness Measurement Location].LAST_UPDT_DT >=
    to_date(to_char((? :d :caption='Enter a Date'),
    'mm/dd/yyyy'), 'mm/dd/yyyy')
    ```

- To view a list of Thickness Measurements created after a specific date, run the following query:

  - For an SQL database:

    ```
    SELECT [MI Thickness Measurement].[MI_THICK_MEASU_ID_CHR]
    "Measurement ID", [MI Thickness Measurement].
    [MI_DP_MEAS_TAKEN_BY_CHR] "Measurement Taken By", [MI Thickness
    Measurement].[MI_THICK_MEAS_TML_KEY_C]
    "TML Key", [MI Thickness Measurement].LAST_UPDT_DT "LAST_UPDT_DT"
    FROM [MI Thickness Measurement] WHERE
    [MI Thickness Measurement].LAST_UPDT_DT >= CONVERT(VARCHAR(255),
    (? :d :caption='Enter a Date'), 110)
    ```

  - For an Oracle database:

    ```
    SELECT [MI Thickness Measurement].[MI_THICK_MEASU_ID_CHR]
    "Measurement ID", [MI Thickness Measurement].
    [MI_DP_MEAS_TAKEN_BY_CHR] "Measurement Taken By", [MI Thickness
    ```

```
Measurement].[MI_THICK_MEASU_READ_PF_C]
"Readings Pass/Fail", [MI Thickness Measurement].
[MI_THICK_MEAS_TML_KEY_C] "TML Key",
[MI Thickness Measurement].LAST_UPDT_DT "LAST_UPDT_DT", [MI
Thickness Measurement].ENTY_KEY "ENTY_KEY"
FROM [MI Thickness Measurement] WHERE [MI Thickness
Measurement].LAST_UPDT_DT >=
to_date(to_char((? :d :caption='Enter a Date'), 'mm/dd/yyyy'),
'mm/dd/yyyy')
```

Configure Data Loader Transaction Scopes

Before You Begin

You must be an administrator user of the server machine where GE Digital APM is installed.

About This Task

By default, the data loaders used in TM split large amounts of data into the following transaction scopes:

- Asset Level Data
- TML Groups in 100-count batches
- Thickness Measurement Locations in 100-count batches
- Measurements in 250-count batches

However, based on the speed of your network connection, configuration of the GE Digital APM Server, or other such factors, you may notice transaction scope errors while uploading large batches of data. To resolve this issue, you can configure the transaction scopes to reduce the number of TML Groups, TMLs, and Measurements per batch.

Procedure

1. Access the server where GE Digital APM is installed.
2. Navigate to the following folder:

   `C:\ProgramData\Meridium\`
3. Access the `MeridiumAppSettings.xml` file.
4. As required, modify the following parameters:

Parameter	Description
`tmlGroupDataloaderBatchSize`	Defines the batch size of TML Groups.
`tmlDataloaderBatchSize`	Defines the batch size of TMLs.
`thicknessMeasurementDataloaderBatch Size`	Defines the batch size of thickness measurements.

5. Save the file.
6. Restart the following services:

   - Redis
   - IIS

   The transaction scopes are updated.

Chapter

10

Admin

Topics:

Global Preferences

Access TM Admin Preferences

Procedure

In the module navigation menu, select **Admin** > **Application Settings** > **Thickness Monitoring**.
The **TM Admin Preferences** page appears.

The following information appears in the page:

- **Global Preferences**: Lets you configure settings that apply throughout Thickness Monitoring. This section appears by default.
- **Family Preferences**: Lets you configure settings for the Equipment or TML Group families, or any other family that you use to store equipment or component data.
- **TM Rules Lookup**: Lets you view and modify the reference table values as needed.
- **Datalogger Mappings**: Lets you define the family field mappings for devices used to take measurements.

Tip: You can modify the Global Preferences by selecting ✎ .

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Enable Interpolation

Before You Begin

Multiple records with varying temperatures and stress values may exist for a given combination of Material Specification, Material Grade, and Design Code values. So, after a match is found on Material Specification, Material Grade, and Design Code, Thickness Monitoring (TM) evaluates Design Temperature.

If the Design Temperature in the TML is an exact match to a temperature value in a Piping Stress or PV Stress record, TM will simply use the corresponding Allowable Stress value. For example, consider a TML that contains the following values:

- Material Specification = SA-216
- Material Grade = B
- Design Code = ASME B31.3
- Design Temperature = 100

Now, consider a Piping Stress record that contains the following values:

- Material Specification = SA-216
- Material Grade = B
- Design Code = ASME B31.3
- Design Temperature = 100
- Allowable Stress = 20000

In this case, the values in the TML are an exact match to the values in the Piping Stress record. Therefore, TM will use the Allowable Stress value of 20000 to calculate Maximum Allowable Working Pressure and T-Min.

Thickness Monitoring uses reference tables to look up the Allowable Stress values for performing T-Min calculations and for calculating Maximum Allowable Working Pressure. You have two choices regarding how the stress reference tables will be used to determine Allowable Stress when an exact match cannot be found:

- You can specify that the lowest temperature in the established range should be used.
- You can specify that Thickness Monitoring should use linear interpolation to determine the Allowable Stress.

By default, interpolation is disabled.

Procedure

1. Access the **TM Admin Preferences** page.

2. In the upper-right corner of the **Global Preferences** workspace, select ✎ .

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✎ is replaced with 🖫 .

3. In the **T-Min Calculator Preferences** section, select the **Use Interpolation for Stress Reference Tables** check box.

4. In the upper-right corner of the workspace, select 🖫 .

   The setting is saved, along with any other changes you have made to the preferences in the **Global Preferences** workspace.

Interpolation Examples

Interpolation is Enabled

If TM cannot find an exact match in the Piping Stress or PV Stress reference table, and the Application Settings specify that interpolation should be used, TM will calculate the interpolated Allowable Stress value using the temperature and stress values that make up a range that includes the TML Design Temperature.

For example, consider a Piping Stress reference table that contains the following two records.

	Record #1	Record #2
Material Specification	SA-403	SA-403
Material Grade	WP316	WP316
Design Code	ASME B31.3	ASME B31.3
Design Temperature	100	200
Allowable Stress	20000	18000

Now, consider a TML that contains the following values:

- Material Specification = SA-403
- Material Grade = WP316
- Design Code = ASME B31.3
- Design Temperature = 150

The TML Design Temperature falls within the range established by the two Piping Stress records in the table. Linear interpolation assumes that stress varies linearly as a function of temperature within the defined range. Using this assumption, the Allowable Stress at 150 degrees can be calculated using the following formula:

$Sx = S1 - (T1 - Tx) / (T1 - T2) * (S1 - S2)$

Where:

- **Sx** = Allowable Stress for the TML
- **$S1$** = Allowable Stress at Lower Boundary
- **$S2$** = Allowable Stress at Upper Boundary
- **$T1$** = Temperature at Lower Boundary
- **Tx** = Temperature defined for TML
- **$T2$** = Temperature at Upper Boundary

Given the values from our example, we calculate **Sx** as:

$Sx = 20000 - ((100 - 150) / (100 - 200) * (20000 - 18000))$

So:

$Sx = 19000$

This interpolated Allowable Stress value will then be used to populate the Allowable Stress field in the TML.

Note: For TM to determine Allowable Stress in this way, the Piping Stress and PV Stress reference tables must contain records that establish the range that includes the TML Design Temperature.

Interpolation is Disabled

If TM cannot find an exact match in the Piping Stress or PV Stress reference table, and the Application Settings specify that interpolation should not be used, TM will use an Allowable Stress value that corresponds to the lowest temperature value in the temperature range that includes the TML Design Temperature.

For example, consider a Piping Stress reference table that contains the following two records.

	Record #1	Record #2
Material Specification	SA-403	SA-403
Material Grade	WP316	WP316
Design Code	ASME B31.3	ASME B31.3
Design Temperature	100	200
Allowable Stress	20000	18000

Now, consider a TML that contains the following values:

- Material Specification = SA-403
- Material Grade = WP316
- Design Code = ASME B31.3
- Design Temperature = 150

In this case, the Design Temperature in the TML is not an exact match to a Piping Stress record. The TML Design Temperature, however, does fall within the temperature range established by the two Piping Stress records in the table. So, in this case, TM will use the record that contains the most conservative (i.e., lowest) Allowable Stress value. Therefore, in this case, an Allowable Stress value of 18,000 will be used in the TML.

Note: For TM to determine Allowable Stress in this way, the Piping Stress and PV Stress reference tables must contain records that establish the range that includes the TML Design Temperature.

Auto Manage Tasks

Before You Begin

Thickness Monitoring Tasks will be created automatically when you create Corrosion Analysis Settings for an asset or TML Group, or a record that stores equipment or component data for a Corrosion Analysis. GE Digital APM provides an option that allows Thickness Monitoring Tasks to be updated automatically when you make changes to a Thickness Measurement Location (TML) record.

The Auto Manage Tasks setting is disabled by default.

Note: TM will create and update Thickness Monitoring Tasks automatically only if the Component ID setting is defined for family to which the TML is directly linked. If this setting is not defined, an error message will appear when TM attempts to create the Thickness Monitoring Task.

Procedure

1. Access the **Global Preferences** workspace.

2. In the upper-right corner of the workspace, select ✏️.

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✏️ is replaced with 💾.

3. In the **Tasks Preferences** section, select the **Auto Manage Tasks?** check box.

4. In the upper-right corner of the workspace, select 💾.

   The setting is saved, along with any other changes you have made to the preferences in the **Global Preferences** workspace.

Results

When the Auto Manage Tasks setting is enabled, the following fields in Thickness Monitoring Task records will be updated when you make changes to a TML. The following list is not comprehensive.

- **Last Date**: The value in the Last Date field is populated with the most recent measurement date that is associated with the first TML referenced in the NID TMLs field in the associated Asset Corrosion Analysis record.

  For example, if the NID TMLs field contained the Entity Keys of the following TMLs in the following order, the most recent measurement date (the value in the Measurement Taken Date field in the linked Thickness Measurement records) associated with TML 03 would be used to populate the Last Date field in the Thickness Monitoring Task record:

  ◦ TML 03
  ◦ TML 14
  ◦ TML 01

- **Desired Interval**: The value in the Desired Interval field is populated with the difference, in days, between the values in the Next Date and Last Date fields in the Thickness Monitoring Task record.

  For example, if the value in the Next Date field is 9/5/2017 and the value in the Last Date field is 3/6/2015, the Desired Interval field would be populated with the value 914.

Define Custom Corrosion Rates

Before You Begin

Thickness Monitoring includes several baseline TML-level corrosion rates that you can choose to calculate for TML Corrosion Analyses. In addition to using these baseline corrosion rates, you can define custom corrosion rate calculations to use within Thickness Monitoring. Using the options on the **Global Preferences** workspace, you can define up to two custom calculations.

Before you can enable the use of custom corrosion rates, you must first create rules that define those corrosion rates. This documentation assumes that the necessary rules have already been defined.

Note: For more information on creating rules, refer to the Rules section of the documentation.

Procedure

1. Access the **Global Preferences** workspace.

2. Select ✏.

   In the **Global Preferences** workspace, the boxes and check boxes are enabled. ✏ is replaced with 💾.

3. In the **Custom Corrosion Rate Options** section, below the **Custom Corrosion Rate A** heading, in the **Label** box, enter the label that you want to use for this custom corrosion rate.
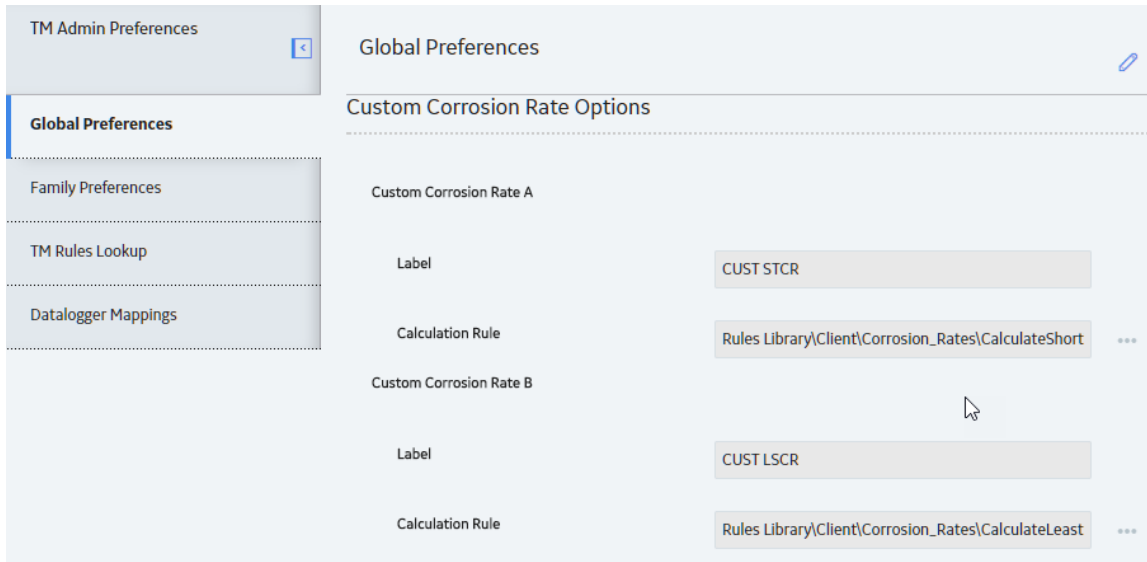
4. To the right of the **Calculation Rule** box, select ⋯.
   The **Select a Project and Method from the Catalog** window appears.
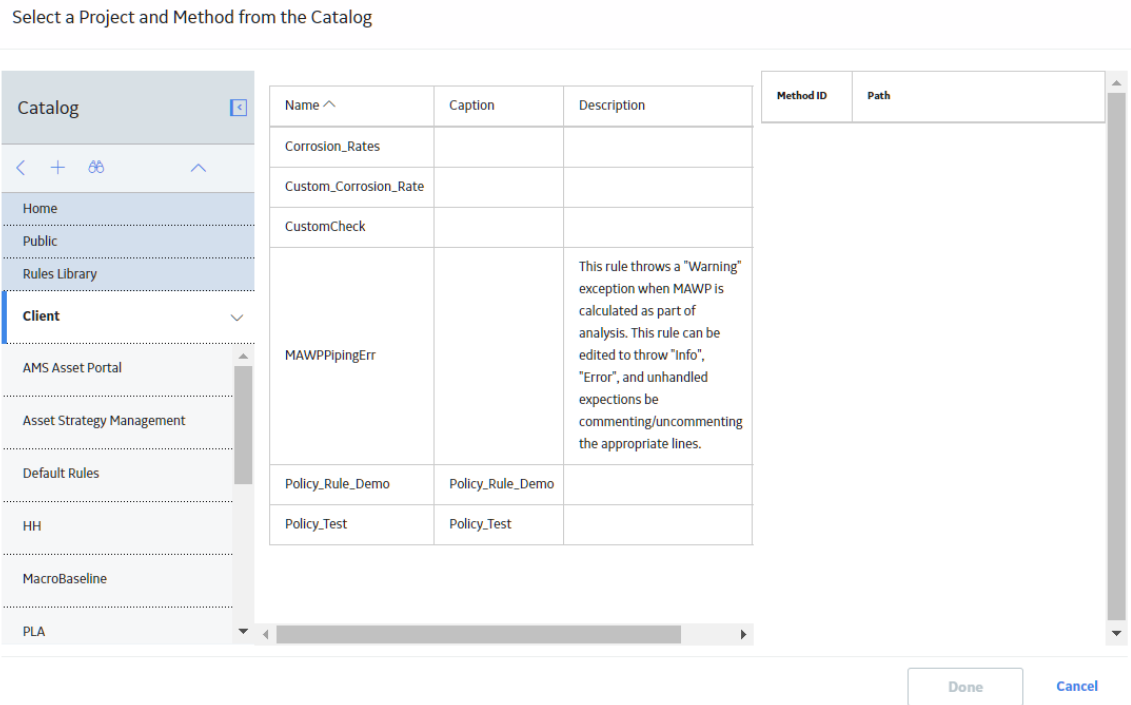
Tip: If you know the path to the method, you can also enter it directly in the **Calculation Rule** box.

5. In the left pane of the window, navigate to and select the **Rules Library** folder containing the project in which the desired rule is defined.
   The middle pane is populated with a list of projects that exist in the selected folder.

6. In the middle pane, select the project that contains the method that you want to use for the corrosion rate rule.
   The right pane is populated with a list of valid methods.

7. In the right pane, select the method.

8. Select **Done**.
   The **Select a Project and Method from the Catalog** window closes.

9. If you want to define a second custom corrosion rate, repeat steps 3 to 8 under the **Custom Corrosion Rate B** heading.

10. In the upper-right corner of the workspace, select 🖫.
    The custom corrosion rate settings are saved along with any other changes to the settings on the **Global Preferences** workspace.

Define Readings Preferences

Procedure

1.

2. Select ✏.

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✏ is replaced with 🖫.

3. In the **Readings Preferences** section, in the **Reading Tolerance** box, enter the value that defines the range within which readings must fall in order to pass evaluation.

Readings Preferences		
Readings Tolerance	0.03	Inches
Readings Calculation Method	Average ⌄	
Custom Rule for Readings Calculation		•••

4. In the **Readings Calculation Method** box, select the value that indicates how you want Thickness Measurement values to be calculated based on the values in the Readings field. You can choose Average, Minimum, Maximum, or Custom.

   Note: For more information on how the Readings Tolerance value is used in calculation, refer to the

   If you select Custom, perform the following steps:

   a) Next to the **Custom Rule for Readings Calculation** box, select •••.
      The **Select a Project and Method from the Catalog** window appears.

Select a Project and Method from the Catalog

b) In the pane containing the project folders, navigate to and select the `Rules Library` folder that contains the project that you want to use for the reading calculation rule.
A list of projects that exist in the selected folder appears.

c) In the pane containing the projects, select the project that contains the method that you want to use for the readings calculation rule.
A list of valid methods within the project appears.

d) Select the method.

e) Select **Done**.
The **Select a Project and Method from the Catalog** window closes.

5. Select 💾.
The settings in the **Global Preferences** workspace are updated.

Configure Nominal T-Min Lookup

Before You Begin

Nominal T-Min is a value that represents the minimum thickness of a pipe based upon accepted industry standards. The Nominal T-Min value takes into account various design specifications and determines the minimum thickness associated with that criteria. The Nominal T-Min value is retrieved using values from Thickness Measurement Location records and records in the Piping Nominal T-Min reference table. Using the **Nominal T-Min Preferences** section, you can configure which fields you want to use for retrieving the Nominal T-Min value for Thickness Measurement Location records that are linked to Equipment or TML Group records that represent pipes, or records that store equipment or component data for pipes.

In the **Nominal T-Min Preferences** section, under the **Fields for Nominal T-Min Lookup** heading is a list of all these fields that exist in the Piping Nominal T-Min family.

Each field in the Piping Nominal T-Min family corresponds to a field in the Thickness Measurement Location family. By selecting a field in the **Fields for Nominal T-Min Lookup** list, you are indicating that you want to use that field for looking up Nominal T-Min values. This means that values in the associated fields in Thickness Measurement Location records will be compared to values in the Piping Nominal T-Min

reference table and that a Nominal T-Min value will be returned only if a match is found. Any field that is not selected in the Fields for Nominal T-Min Lookup list will not be used for looking up the Nominal T-Min value. In other words, values in those fields of Thickness Measurement Location records are not required to match values in corresponding field in the Piping Nominal T-Min reference table.

Note: If no fields are selected in the Fields for Nominal T-Min Lookup list, the Nominal T-Min Lookup feature will be disabled. In other words, a Nominal T-Min value will never be retrieved automatically for any Thickness Measurement Location record.

Procedure

1. Access the **Global Preferences** workspace.

2. In the upper-right corner of the workspace, select ✎ .

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✎ is replaced with 💾 .

3. In the **Nominal T-Min Preferences** section, in the **Fields for Nominal T-Min Lookup** list, select the fields that you want to use for retrieving Nominal T-Min values.

4. In the upper-right corner of the workspace, select 💾 .

   The setting is saved, along with any other changes you have made to the preferences in the **Global Preferences** workspace.

Define Measurement Preferences

Before You Begin

If you enable this option and create Measurement Not Taken records and then later disable this option, any Measurement Not Taken records that you created will be ignored in the Corrosion Analysis (i.e., all calculations will be performed as if the Measurement Not Taken records did not exist).

Procedure

1. Access the **Global Preferences** workspace.

2. In the upper-right corner of the workspace, select ✎ .

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✎ is replaced with 💾 .

3. Select the **Allow Measurements to be Skipped** check box.

   The **Allow Consecutive Skipped Measurements** check box is enabled.

4. If you want to be able to create back-to-back Measurement Not Taken records, select the **Allow Consecutive Skipped Measurements** check box.

5. In the upper-right corner of the workspace, select 💾 .

   The setting is saved, along with any other changes you have made to the preferences in the **Global Preferences** workspace.

Map Common Measurement Data Fields

Before You Begin

When you make changes to the **Common Measurement Data Field Mappings** section, the new fields you map will be made available on the **Measurement Data Entry** workspace, in the common measurement data section. By default, Measurement Comment and Measurement Status Indicator fields are available to map. Additionally, any custom fields you create for the Thickness Measurement family will appear in the list of available fields.

For example, if you select the Measurement Comment and Measurement Status Indicator fields to be mapped to the common measurement data section, the following screenshot illustrates how they will appear on the Measurement Data Entry workspace.

Procedure

1. Access the **Global Preferences** workspace.

2. In the upper-right corner of the workspace, select ✎ .

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✎ is replaced with 💾 .

3. In the **Common Measurement Data Field Mappings** section, select up to three fields you want to appear in the common measurement data section of the **Measurement Data Entry** workspace.

4. In the upper-right corner of the workspace, select 💾 .
   The setting is saved, along with any other changes you have made to the preferences in the **Global Preferences** workspace.

Modify the High Loss Value

Procedure

1. Access the **Global Preferences** workspace.

2. In the upper-right corner of the workspace, select ✏️.

   The boxes and check boxes in the **Global Preferences** workspace are enabled. ✏️ is replaced with 💾.

3. In the **Color-Coding Preferences** section, in the **High Loss** box, enter a value between 0 and 100.

4. In the upper-right corner of the page, select 💾.

   The High Loss value is modified.

Results

- When you create or update a Thickness Measurement, if the percentage of decrease in the measurement value from the previous measurement is greater than or equal to the new High Loss value, then, in the **Analysis Overview** workspace, in the **TMLs** section, 🔴 appears in the row containing the TML. This, however, happens only if the TML does not meet the criteria for the categories Below T-Min or Overdue.

Manage Thickness Monitoring Rules Lookup Records

Before You Begin

Thickness Monitoring Rules Lookup records create a reference table of values that are used by GE Digital APM Thickness Monitoring for performing certain calculations. Like all reference table records, Thickness Monitoring Rules Lookup records can be viewed most easily in the Bulk Data Form or through a query. For your convenience, the TM Administrative Tasks page contains a link that allows you to open Thickness Monitoring Rules Lookup records in the Bulk Data Form, where you can view and modify the reference table values as needed.

Procedure

1. Access the **TM Admin Preferences** page.
2. Select the **TM Rules Lookup** tab.
   A list of all TM Rules Lookup records are displayed in the bulk data form.

   Note: Unsaved changes to the TM bulk data form result in a ✏️ appearing in the first column. After saving, the ✏️ becomes a ✔️.

3. Make any necessary changes, and then select 🖫.
   Any changes to or new TM Rules Lookup records are saved.

Family Preferences

Configure Family Preferences

Before You Begin

By default, Thickness Monitoring is configured to use Equipment family as the foundational source of records to which other records, such as Asset Corrosion Analyses and TML Groups, will be linked. Most commonly, if you are making changes to the Family Preferences, it is to implement the Functional Location family as the foundational source of records. When Functional Locations are correctly configured, Asset View is enabled in Thickness Monitoring.

This procedure assumes you want to configure the Functional Location family. Before you complete these steps, the Functional Location family should be configured as a Predecessor to the following Relationship Families:

• Has Corrosion Analyses
• Has Corrosion Analysis Settings
• Has TML Group
• Has TML

Procedure

1. Access the **TM Admin Preferences** page, and then select **Family Preferences** in the left pane.
   The **Family Preferences** workspace appears.
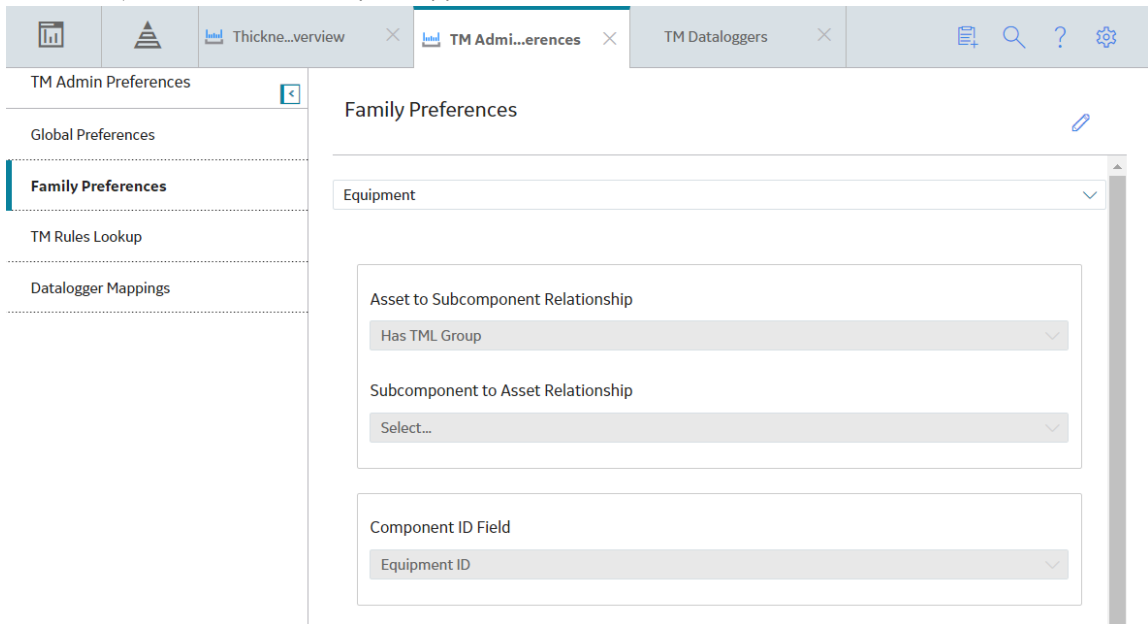
2. In the upper-right corner of the workspace, select ✏️ .

   The boxes in the **Family Preferences** workspace are enabled. ✏️ is replaced with 💾 .

3. In the box at the top of the workspace, select the family you want to configure. By default, the available options are Equipment, Functional Location, and TML Group.
   The **Asset to Subcomponent Relationship**, **Subcomponent to Asset Relationship**, and **Component ID Field** boxes appear.
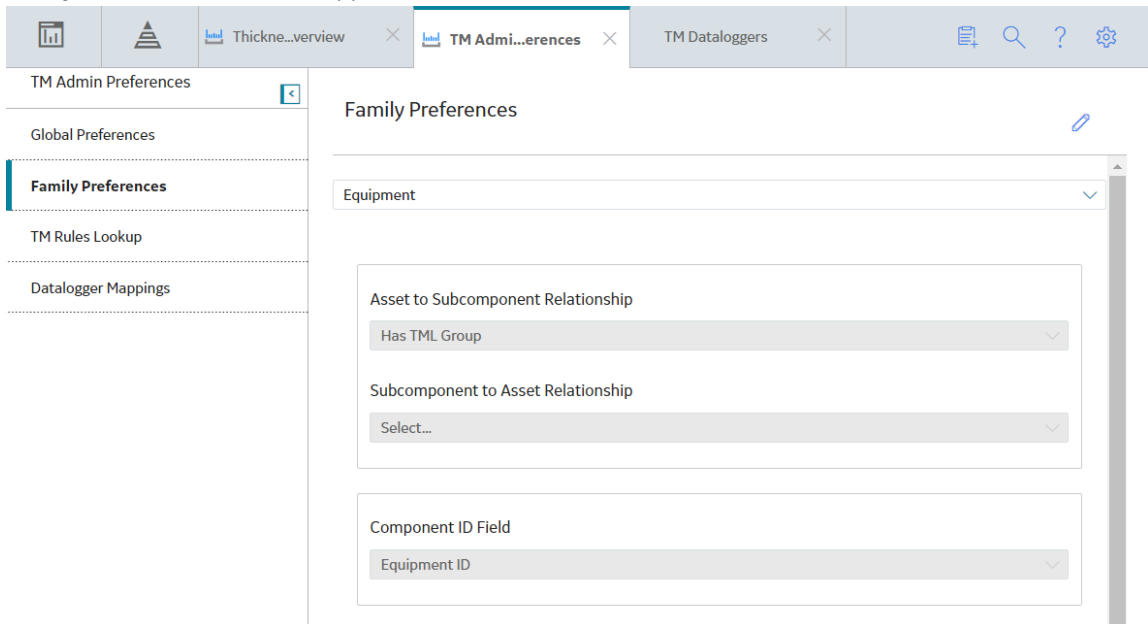
4. If you want to configure Thickness Monitoring to use Functional Locations, in the box at the top of the workspace, select **Functional Location**.

5. In the **Asset to Subcomponent Relationship** and **Subcomponent to Asset Relationship** boxes, select **Has TML Group**.
6. In the **Component ID Field** box, select **Functional Location**.
7. In the upper-right corner of the workspace, select 🖫.
   The setting is saved, along with any other changes you have made to the preferences in the **Global Preferences** workspace.

Results

- ⬈ is enabled on the **Thickness Monitoring Overview** workspace.
- TML Groups and TMLs can now be linked directly to a Functional Location. When you first select a Functional Location and select ⬈, you will be automatically directed to create Corrosion Analysis Settings for that Functional Location.

About Family Preferences

You will use the **Family Preferences** workspace to define settings for families that are used in Thickness Monitoring.

If you follow the TM Best Practice, you can define settings for the Equipment or TML Group families via this page. If you do not follow the TM Best Practice, you can define settings for families that store equipment or component data. Regardless of whether or not you follow the TM Best Practice, these settings must be configured at the level where records will actually be stored.

The settings that you define on the Family Preferences workspace will define the field in the following records that will be used to populate the following fields in Thickness Measurement Location and Thickness Monitoring Task records in your Corrosion Analysis.

- If you follow the TM Best Practice, these settings will determine the field in the Equipment or TML Group record that should be used to:
  - Populate the TML Asset ID field in the Thickness Measurement Location records that are linked to Equipment or TML Group records.
  - Populate the Task ID field in Thickness Monitoring Task records that are created automatically and linked to Equipment or TML Group records.
- If you do not follow the TM Best Practice, these settings will determine field in the record stores equipment or component data that should be used to:
  - Populate the TML Asset ID field in the Thickness Measurement Location records that are linked to records that store equipment or component data.
  - Populate the Task ID field in Thickness Monitoring Task records that are created automatically and linked to records that store equipment or component data.

Additionally, if your Corrosion Analyses will contain TML Group records or other records that store component data, you will also need to define the relationship between certain families via the **Family Preferences** workspace.

- If you follow the TM Best Practice, you should define the relationship between the Equipment family and the TML Group family via this page.
- If you do not follow the TM Best Practice, you should define the relationship between the family that stores equipment data and the family that stores component data via this page.

About Subcomponent Relationships

If your Corrosion Analysis includes TML Group records or other records that store component data, you will need to define Subcomponent Relationship preferences for certain families. These settings determine

which records Thickness Monitoring will include in a Corrosion Analysis and which families will be included throughout Thickness Monitoring.

Note: Thickness Monitoring Best Practice assumes that your Corrosion Analyses include TML Groups.

For example, if your Corrosion Analysis contains TML Groups, and you are analyzing a piping circuit that contains three piping lines, you would store information for the piping circuit in the following four records:

- Equipment (piping circuit)
- TML Group (piping line 1)
- TML Group (piping line 2)
- TML Group (piping line 3)

In this case, the TML Groups would be linked to the Equipment record through the Has TML Group relationship.

Continuing with the example, if you do not use TML Group records, but your Corrosion Analysis contains records that store component data, and you are analyzing the same piping circuit, you would store information in four records, one that stores equipment data and three that store component data. In this case, you would need to specify the relationship that links the records that store equipment data to the records that store component data.

The **Subcomponent Relationship** section in the **Family Preferences** workspace contains the following lists that allow you to define these settings:

- **Asset-to-Subcomponent Relationship**: Specifies the relationship family that links certain records used in a Corrosion Analysis, depending upon whether or not you follow the TM Best Practice.

  ◦ If you follow the TM Best Practice, your selection in this list specifies how Equipment records will be linked to TML Group records. You should select Has TML Group in this list.
  ◦ If you do not follow the TM Best Practice, your selection in this list specifies how records that store equipment data will be linked to records that store component data.

    Note: If you do not follow TM Best Practice, you should configure your desired record in addition to Equipment records. That is to say, you should not remove the relationship preferences for Equipment records.

  If a component represented by a TML Group record or another record that stores component data can contain additional components in a multi-tier record hierarchy, this setting should also be defined for TML Group family or the family that stores component data.

- **Subcomponent-to-Asset Relationship**: Specifies the relationship family that links certain records used in a Corrosion Analysis, depending upon whether or not you follow the TM Best Practice.

  ◦ If you follow the TM Best Practice, your selection in this list specifies how TML Group records will be linked to Equipment records. You should select Has TML Group in this list.
  ◦ If you do not follow the TM Best Practice, your selection in this list specifies how records that store component data will be linked to records that store equipment data.

Datalogger Mappings

Create a Datalogger Mapping

About This Task

Datalogger Mappings are one-to-one relationships between fields in GE Digital APM families and fields on various dataloggers that are supported by Thickness Monitoring.

The **Datalogger Mappings** workspace contains a list of baseline mappings. This topic describes how to create an additional mapping.

Important: To avoid data integrity issues:

- Do not modify mappings for the TML Asset ID and TML ID fields.
- When you add a mapping, ensure that:
  - The source and target fields are of the same data type.
  - The combination of source and target fields is unique (i.e., there is a one-to-one relationship between the source and target fields).

Procedure

1. Access the **TM Admin Preferences** page.
2. In the left pane, select the **Datalogger Mappings** tab.
   The Datalogger Mappings workspace appears, displaying a list of mappings.

3. Navigate to the blank row at the bottom of the list, and enter values in the available fields.

   Tip: If you want to add more mappings, press Tab. Another blank row appears at the bottom of the list.

4. In the upper-right corner of the workspace, select ⊟.
   The Datalogger Mapping has been created. In the row containing the mapping that you have added, the ➕ icon is replaced with the ✔ icon.

Results

- If the value in the Transfer Direction field is Send To (T), then, for the datalogger for which you have created the mapping:
  - The newly created mapping appears in the grid in the **Send To** section on the **TM Dataloggers** page.
  - When you Send Data to a Datalogger on page 108, the value in the Source Field field that you have specified in the mapping is also sent to the device.
- If the value in the Transfer Direction field is Receive From (F), then, for the datalogger for which you have created the mapping:

◦ The newly created mapping appears in the grid in the **Receive From** section on the **TM Dataloggers** page.

◦ When you Receive Data from a Datalogger on page 113, the value in the Source Field field that you have specified in the mapping is populated with the value from the device field.

Delete a Datalogger Mapping

About This Task

Important: Do not delete the mapping between the following fields. If you do so, you will not be able to send or receive data using the datalogger.

Source Field	Source Family	Target Field
TML Asset ID	Thickness Measurement Location	Asset ID
TML ID	Thickness Measurement Location	Datapoint ID
Number of Readings	Thickness Measurement Location	Number of Readings
Readings	Thickness Measurement	Reading Values
Measurement Taken Date	Thickness Measurement	Measurement Taken Date

Procedure

1. Access the **TM Admin Preferences** page.
2. In the left pane, select the **Datalogger Mappings** tab.
   The **Datalogger Mappings** workspace appears, displaying a list of mappings.

3. In the upper-right corner of the workspace, select ☑.
   A column of check boxes appears in the grid.

4. In the row containing the mapping that you want to delete, select the check box.

5. In the upper-right corner of the workspace, select ⋮ , and then select **Delete**.
   A message appears, asking you to confirm that you want to delete the mapping.

6. Select **Yes**.
   The Datalogger Mapping is deleted.

Results

Depending on the value in the Transfer Direction field in the mapping that you deleted, the data related to the mapping is no longer sent to or received from the datalogger.

Datalogger Mapping Records

Datalogger Mapping records are used to determine the relationship between fields in GE Digital APM families and fields used in a datalogger. This topic provides an alphabetical list and description of the fields that exist for the Datalogger Mapping family. The information in the table reflects the baseline state and behavior of these fields.

This family is not enabled for site filtering, which means that records in this family can be accessed by any user with the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Field	Data Type	Description	Behavior and Usage
Device Type	Character	The type of the datalogger whose field you want to map.	This field contains the description of all the System Codes in the M655 System Code Table. You can choose from the following baseline values: • GE DMS2 • GE DMS Go/Go+ • Olympus 37DL Plus Ultrasonic Thickness Gage • Olympus 37DL Plus Ultrasonic Thickness Gage
Source Family	Character	The name of the GE Digital APM family whose field you want to map as the source.	If the value in the Transfer Direction field is Send To (T), then this field contains the following list of families: • Thickness Measurement Location • TML Corrosion Analysis If the value in the Transfer Direction field is Receive From (F), then this field contains the following list of families: • Thickness Measurement • Thickness Measurement Location
Source Field	Character	The name of the field that you want to map as the source.	This field contains a list of fields in the family that you have selected in the Source Family field.

Field	Data Type	Description	Behavior and Usage
Target Field	Character	The name of the field that you want to map as the target.	This field contains a list of fields in the datalogger that you have selected in the Device Type field. It contains the description of the system Codes in the M658 System Code Table. You must only use the baseline fields that appear in this field. By default, on the **TM Dataloggers** page, in the **Send To** and **Receive From** sections, the rows in the grids are arranged in the alphabetical order of the values in the **Target Field** column.
Transfer Direction	Character	Indicates whether data is sent to or received from the datalogger.	This field contains the description of all the System Codes in the M656 System Code Table. You can choose from the following baseline values: • Send To (T) • Receive From (F)

Baseline Datalogger Mapping Records

The following table provides the field values in baseline Datalogger Mappings.

Device Type	Transfer Direction	Source Family	Source Field	Target Field
GE DMS Go/Go+	Receive From (F)	Thickness Measurement	Measurement Taken Date	Date Last Updated
GE DMS Go/Go+	Receive From (F)	Thickness Measurement	Readings	Reading Values
GE DMS Go/Go+	Receive From (F)	Thickness Measurement Location	TML Asset ID	Asset ID
GE DMS Go/Go+	Receive From (F)	Thickness Measurement Location	TML ID	Datapoint ID
GE DMS Go/Go+	Send To (T)	Thickness Measurement Location	TML Asset ID	Asset ID
GE DMS Go/Go+	Send To (T)	Thickness Measurement Location	TML ID	Datapoint ID
GE DMS Go/Go+	Send To (T)	Thickness Measurement Location	Location	Datapoint Location

Device Type	Transfer Direction	Source Family	Source Field	Target Field
GE DMS Go/Go+	Send To (T)	Thickness Measurement Location	Number of Readings	Number of Readings
GE DMS Go/Go+	Send To (T)	TML Corrosion Analysis	Last Measurement Date	Date Last Updated
GE DMS Go/Go+	Send To (T)	TML Corrosion Analysis	Last Measurement Value	Measurement Value
GE DMS2	Receive From (F)	Thickness Measurement	Measurement Taken Date	Date Last Updated
GE DMS2	Receive From (F)	Thickness Measurement	Readings	Reading Values
GE DMS2	Receive From (F)	Thickness Measurement Location	TML Asset ID	Asset ID
GE DMS2	Receive From (F)	Thickness Measurement Location	TML ID	Datapoint ID
GE DMS2	Send To (T)	Thickness Measurement Location	TML Asset ID	Asset ID
GE DMS2	Send To (T)	Thickness Measurement Location	TML ID	Datapoint ID
GE DMS2	Send To (T)	Thickness Measurement Location	Location	Datapoint Location
GE DMS2	Send To (T)	Thickness Measurement Location	Number of Readings	Number of Readings
GE DMS2	Send To (T)	TML Corrosion Analysis	Last Measurement Date	Date Last Updated
GE DMS2	Send To (T)	TML Corrosion Analysis	Last Measurement Value	Measurement Value
Olympus 37DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement	Measurement Taken Date	Date Last Updated
Olympus 37DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement	Readings	Reading Values
Olympus 37DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement Location	TML Asset ID	Asset ID
Olympus 37DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement Location	TML ID	Datapoint ID
Olympus 37DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	TML Asset ID	Asset ID

Device Type	Transfer Direction	Source Family	Source Field	Target Field
Olympus 37DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	TML ID	Datapoint ID
Olympus 37DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	Location	Location Description
Olympus 37DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	Number of Readings	Number of Readings
Olympus 37DL Plus Ultrasonic Thickness Gage	Send To (T)	TML Corrosion Analysis	Last Measurement Date	Date Last Updated
Olympus 37DL Plus Ultrasonic Thickness Gage	Send To (T)	TML Corrosion Analysis	Last Measurement Value	Measurement Value
Olympus 38DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement	Measurement Taken Date	Date Last Updated
Olympus 38DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement	Readings	Reading Values
Olympus 38DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement Location	TML Asset ID	Asset ID
Olympus 38DL Plus Ultrasonic Thickness Gage	Receive From (F)	Thickness Measurement Location	TML ID	Datapoint ID
Olympus 38DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	TML Asset ID	Asset ID
Olympus 38DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	TML ID	Datapoint ID
Olympus 38DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	Location	Location Description
Olympus 38DL Plus Ultrasonic Thickness Gage	Send To (T)	Thickness Measurement Location	Number of Readings	Number of Readings

Device Type	Transfer Direction	Source Family	Source Field	Target Field
Olympus 38DL Plus Ultrasonic Thickness Gage	Send To (T)	TML Corrosion Analysis	Last Measurement Date	Date Last Updated
Olympus 38DL Plus Ultrasonic Thickness Gage	Send To (T)	TML Corrosion Analysis	Last Measurement Value	Measurement Value

Chapter

11

Deployment

Topics:

Deploy TM for the First Time

Before You Begin

The following table outlines the steps that you must complete to deploy and configure this module for the first time. These instructions assume that you have completed the steps for deploying the basic system architecture.

These tasks may be completed by multiple people in your organization. GE Digital recommends, however, that the tasks be completed in the order in which they are listed.

If you are deploying this module in APM Now, before you begin completing these tasks, review the system requirements for this module to identify the supported features for this module in APM Now. Unless noted, all deployment tasks in the following table are applicable for the deployment of this module in APM Now.

Results

Step	Task	Notes
1	Review the TM data model to determine which relationship definitions you will need to modify to include your custom equipment families. Via Configuration Manager, modify the relationship definitions as needed.	This step is required only if you store equipment and location information in families other than the baseline Equipment and Functional Location families.
2	Assign Security Users to one or more of the Security Roles used in TM.	This step is required. User must have permissions to the TM families in order to use the TM functionality.
3	Assign Resource Roles to users by performing the following steps: 1. Access the Human Resource record for each user. 2. In the **Role** box, select **TM Technician**.	This step is required to allow a user (typically, a TM Inspector) to enter details in an Inspection record.

Step	Task	Notes
4	Configure Family Preference Application Settings.	This step is required. You must configure preferences for the families that will be used to store equipment data in Thickness Monitoring. The following relationships must be defined: • For the Equipment family, the Asset to Subcomponent Relationship field must be set to **Has TML Group**, and the Component ID field must be set to **Equipment ID**. The Subcomponent to Asset Relationship field should be left blank. • For the TML Group family, the Subcomponent to Asset Relationship field must be set to **Has TML Group**, and the Component ID field must be set to **TML Group ID**. The Asset to Subcomponent Relationship field should be left blank.
5	Configure Global Preference Application Settings.	This step is required only if you want to use custom reading preferences and Nominal T-Min preferences. Baseline reading preferences and Nominal T-Min preferences will be used if you do not define your own. You can also define additional, optional global preferences that are not defined in the baseline GE Digital APM database.
6	Configure the system to use custom TML Types.	This step is required only if you want to use custom TML Types. You can define additional TML Types to use in your Corrosion Analyses.
7	Manage Thickness Monitoring Rules Lookup records.	This step is required only if you want to view or modify Thickness Monitoring Rules Lookup records whose values are used to perform certain TM calculations.
8	Define additional fields that will be displayed in the header section of the TM Measurement Data Entry.	This step is required only if default Thickness Measurement fields are displayed on the headings of these pages in the baseline GE Digital APM database. You can specify that additional fields be displayed in the header section of these pages.
9	Disable the Auto Manage Tasks setting.	This step is required only if you are planning to use TM tasks.

Step	Task	Notes
10	Install the Meridium Device Service on all of the machines that will connect to devices that will be used with Thickness Monitoring.	This step is required only if you will use any device to collect data that you transfer to Thickness Monitoring. If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.
11	Install the drivers and supporting files for any devices on all of the machines that will connect to devices that will be used with Thickness Monitoring.	This step is required only if you will use these devices to collect data that you transfer to Thickness Monitoring.

Upgrade or Update Thickness Monitoring to V4.4.0.0.0

Before You Begin

The following tables outline the steps that you must complete to upgrade this module to V4.4.0.0.0. These instructions assume that you have completed the steps for upgrading the basic GE Digital APM system architecture.

These tasks may be completed by multiple people in your organization. We recommend, however, that the tasks be completed in the order in which they are listed.

Procedure

• Upgrade from any version V4.3.0.0.0 through V4.3.1.0.4

Step	Task	Notes
1	Uninstall the previous version of the Meridium Device Service on all of the machines that will connect to devices that will be used with Thickness Monitoring.	This step is required only if you will use any device to collect data that you transfer to Thickness Monitoring.
2	Install the Meridium Device Service on all of the machines that will connect to devices that will be used with Thickness Monitoring.	This step is required only if you will use any device to collect data that you transfer to Thickness Monitoring. If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.
3	If you have previously modified the following Pipe Properties records, follow the steps mentioned in https://digitalsupport.ge.com/communities/CC_Login?startURL=%2Fcommunities%2Fen_US%2FArticle%2FTM-Incorrect-entries-in-Pipe-Properties-family-records to get the updated values for the records. (table below)	This step is optional.

Schedule	Nominal Diameter - NPS	Nominal Diameter - DN	Outside Diameter	Nominal Wall Thickness (Old)	Internal Diameter (Old)	Nominal Wall Thickness (New)	Internal Diameter (New)
30	2.5	65	2.875 (Inches)	0.125 (Inches)	2.625 (Inches)	0.188 (Inches)	2.499 (Inches)
40	36	900	36 (Inches)	0.688 (Inches)	34.624 (Inches)	0.75 (Inches)	34.5 (Inches)

- Upgrade from any version V4.2.0.0 through V4.2.0.9.4

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V4.1.0.0 through V4.1.7.4.0

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V4.0.0.0 through V4.0.1.0

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V3.6.1.0.0 through V3.6.1.7.4

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V3.6.0.0.0 through V3.6.0.12.9

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V3.5.1 through V3.5.1.12.3

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V3.5.0 SP1 LP through V3.5.0.1.10.1

Step	Task	Notes
1	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	This step is required.

- Upgrade from any version V3.5.0 through V3.5.0.0.7.1

Step	Task	Notes
1	Manually update TM Analyses for which you used custom corrosion rates. To do so: 1. Locate the records that you will need to update by running the following query: SELECT [MI_EQUIP000].[MI_EQUIP000_EQUIP_ID_C] "Equipment ID", [MI_TMLGROUP].[MI_TMLGROUP_ID_C] "TML Group ID", [MI Thickness Measurement Location].[MI_DP_ASSET_ID_CHR] "TML Asset ID", [MI Thickness Measurement Location].[MI_DP_ID_CHR] "TML ID", [MI TML Corrosion Analysis].[MI_TML_CA_A_CR_N] "Custom Calculation A Corros", [MI TML Corrosion Analysis].[MI_TML_CA_B_CR_N] "Custom Calculation B Corros" FROM [MI_EQUIP000] JOIN_SUCC [MI_TMLGROUP] JOIN_SUCC [MI Thickness Measurement Location] JOIN_SUCC [MI TML Corrosion Analysis] ON {MI Has Corrosion Analyses} ON {MI Has Datapoints} ON {MIR_HSTMLGP} WHERE ([MI TML Corrosion Analysis].[MI_TML_CA_A_CR_N] > 0 AND [MI TML Corrosion Analysis].[MI_TML_CA_B_CR_N] > 0) 2. Use the Bulk Analyze tool to update TM Analyses associated with the Equipment and TML Group records returned by this query. **Note:** These instructions assume that you are using the baseline Equipment and TML Group families. If you use custom equipment families, you must replace the following values before running the query in order to identify the records requiring update: ◦ MI_EQUIP000 and MI_TMLGROUP with your custom family IDs. ◦ MI_EQUIP000_EQUIP_ID_C and MI_TMLGROUP_ID_C with the field IDs used to identify these custom equipment records. 3. Run the Bulk Analyze tool using your custom records.	This step is required only if, in previous versions of Meridium APM, you used custom corrosion rates in your TM Analyses. If you did so, certain fields in the associated TML Corrosion Analysis records were populated with values using the unit of measure (UOM) inches per day instead of IN/YR (TM) (i.e., inches per year), which is the UOM that is specified in the properties of the fields. To correct this issue in existing records, you must perform this step to manually update TM Analyses. For more information about this issue, see the V3.5.1 Release Notes.
2	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	

- Upgrade from any version V3.4.5 through V3.4.5.0.1.4

Step	Task	Notes

1	Update certain TM Analyses to correct TML Corrosion Analyses for which you performed measurement variance evaluation prior to GE Digital APM. To do so:
	
	1. Locate the records that you will need to update by creating a query that returns TML Corrosion Analyses whose:
	
	   ◦ Short Term Corrosion Rate field contains the value 0 (zero).
	   ◦ Allowable Measurement Variance Applied field is set to True.
	
	2. Use the Bulk Analyze tool to update TM Analyses that are associated with TML Corrosion Analyses returned by the query you created in step 1.
		This step is required.

Step	Task	Notes
2	Manually update TM Analyses for which you used custom corrosion rates. To do so: 1. Locate the records that you will need to update by running the following query: SELECT [MI_EQUIP000].[MI_EQUIP000_EQUIP_ID_C] "Equipment ID", [MI_TMLGROUP].[MI_TMLGROUP_ID_C] "TML Group ID", [MI Thickness Measurement Location].[MI_DP_ASSET_ID_CHR] "TML Asset ID", [MI Thickness Measurement Location].[MI_DP_ID_CHR] "TML ID", [MI TML Corrosion Analysis].[MI_TML_CA_A_CR_N] "Custom Calculation A Corros", [MI TML Corrosion Analysis].[MI_TML_CA_B_CR_N] "Custom Calculation B Corros" FROM [MI_EQUIP000] JOIN_SUCC [MI_TMLGROUP] JOIN_SUCC [MI Thickness Measurement Location] JOIN_SUCC [MI TML Corrosion Analysis] ON {MI Has Corrosion Analyses} ON {MI Has Datapoints} ON {MIR_HSTMLGP} WHERE ([MI TML Corrosion Analysis].[MI_TML_CA_A_CR_N] > 0 AND [MI TML Corrosion Analysis].[MI_TML_CA_B_CR_N] > 0) 2. Use the Bulk Analyze tool to update TM Analyses associated with the Equipment and TML Group records returned by this query. **Note:** These instructions assume that you are using the baseline Equipment and TML Group families. If you use custom equipment families, you must replace the following values before running the query in order to identify the records requiring update: ◦ MI_EQUIP000 and MI_TMLGROUP with your custom family IDs. ◦ MI_EQUIP000_EQUIP_ID_C and MI_TMLGROUP_ID_C with the field IDs used to identify these custom equipment records. 3. Run the Bulk Analyze tool using your custom records.	This step is required only if, in previous versions of Meridium APM, you used custom corrosion rates in your TM Analyses. If you did so, certain fields in the associated TML Corrosion Analysis records were populated with values using the unit of measure (UOM) inches per day instead of IN/YR (TM) (i.e., inches per year), which is the UOM that is specified in the properties of the fields. To correct this issue in existing records, you must perform this step to manually update TM Analyses. For more information about this issue, see the V3.5.1 Release Notes.
3	If you are using HTTPS to connect to GE Digital APM, follow the instructions in https://ge-ip.my.salesforce.com/kA20h0000009SCN?srPos=0&srKp=ka2&lang=en_US.	

Use Custom TML Analysis Types

The baseline GE Digital APM database includes the Thickness Measurement Location family, which contains the TML Analysis Type field. This field is used to classify TMLs based upon the collection method that will be used for recording Thickness Measurements at that location.

The TML Analysis Type field contains a list of values that is populated with the Corrosion Inspection Type values from all Corrosion Analysis Settings records that are associated with the asset or TML Group to which the Thickness Measurement Location record is linked.

The values that are used to populate the Corrosion Inspection Type field in the Corrosion Analysis Settings family are stored in the System Code Table CITP (Corrosion Inspection Type). In the baseline GE Digital APM database, this table contains three System Codes: UT, RT, and TML. You can only create Thickness Measurement Location records with a given TML Analysis Type value if an associated Corrosion Analysis Settings record contains the same value in the Corrosion Inspection Type field.

Using the baseline functionality, you can separate Corrosion Analysis calculations into groups based upon TML Analysis Type. If you want to use this functionality, you will want to classify your TMLs as UT (measurements collected using ultrasonic thickness) or RT (measurements collected using radiographic thickness). This separation will be desirable for some implementations. Other implementations will prefer not to separate TMLs according to collection method and instead perform calculations on the entire group of TMLs that exists for an asset. For these implementations, you will want to classify all TMLs using the TML Analysis Type TML.

Depending upon your preferred implementation, you may choose to make one or more of the following changes to the System Code Table CITP (Corrosion Inspection Type):

- Add System Codes if you want to classify TMLs using methods in addition to UT and RT.
- Delete System Codes that you do not want to use.
- Modify the IDs and descriptions of the System Codes so that the classification options are more intuitive to your users.

If you make changes to this System Code Table, keep in mind that the analysis types that are stored in the System Code Table CITP (Corrosion Inspection Type) will be used when you create Corrosion Analysis Settings records, and therefore, will determine the analysis types for which you can create Thickness Measurement Location records.

Additionally, in Thickness Measurement Location records, the TML Analysis Type field has a baseline Default Value rule that is coded to present UT as the default value when you have defined the UT TML Analysis Type in your Corrosion Analysis (i.e., you have created a Corrosion Analysis Settings record with a Corrosion Inspection Type of UT). You could modify this rule if, for example, you wanted RT to be presented as the default value when you have defined the RT TML Analysis Type in your Corrosion Analysis (i.e., you have created a Corrosion Analysis Settings record with a Corrosion Inspection Type of RT). To do this, you would modify the MI_TML_TYPE_CHR class as follows:

```
<MetadataField("MI_TML_TYPE_CHR")>  _
Public Class MI_TML_TYPE_CHR
    Inherits
Baseline.MI_Thickness_Measurement_Location.MI_TML_TYPE_CHR
    Public Sub New(ByVal record As
Meridium.Core.DataManager.DataRecord, ByVal field As
Meridium.Core.DataManager.DataField)
        MyBase.New(record, field)
    End Sub
    Public Overrides Function GetDefaultInitialValue() As
```

```
Object
                        Return CStr("RT")
                End Function
        End Class
```

Note: For more information on customizing baseline rules, refer to the Rules section of the documentation.

Install the Meridium Device Service

About This Task

Important: You must repeat this procedure on every machine to which a datalogger will be connected.

Note: If you are using Predix APM or the URL is secured (https), follow the instructions in https://digitalsupport.ge.com/communities/en_US/Article/HOW-TO-V4-Thickness-Monitoring-Devices-Dataloggers-and-Secure-HTTPS-Browsers-on-Windows-Machines-1553989641712 to install the Meridium Device Service.

Procedure

1. Access the **Access Dataloggers** page
2. Select **Send**.

   Note: A datalogger does not need to be connected.

   The **Meridium Device Service Not Found** window appears.
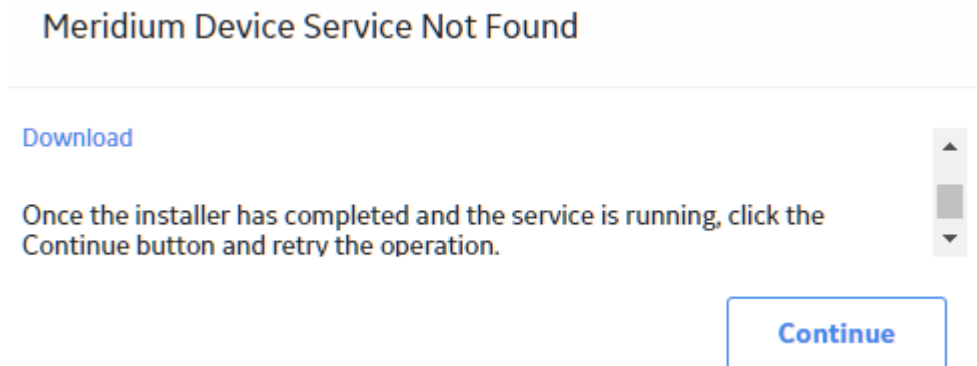
3. Select the **Download** link.
   MeridiumDevices.exe is downloaded.
4. Run **MeridiumDevices.exe**, and then follow the instructions in the installer.
   The Meridium Device Service is installed.
5. In the **Meridium Device Service Not Found** window, select **Continue**.
   Dataloggers can now be used with Thickness Monitoring.

Configure the Meridium Device Service

Procedure

1. In Windows Explorer, navigate to **C:\Program Files\Meridium\Services**.

2. Using a text editor, open the **Meridium.Service.Devices.exe.config** file.
3. In the text editor, navigate to the **appSettings** section (lines 24 to 28).

   - On line 25, edit the port number used by the service.

     Note: The datalogger settings in Thickness Monitoring must be modified so that the port number matches the one defined in this step.

   - On line 26, edit the timeout value in milliseconds. By default, the value for this setting is 60000, or 1 minute.
   - On line 27, if your organization utilizes a different URL protocol for GE Digital APM, edit the protocol the service should use. For example, http://* can be changed to https://*.

4. Save the file, and then close the text editor.
5. Restart the Meridium Device Service.

   The Meridium Device Service configuration settings are updated.

TM Functional Security Privileges

GE Digital APM provides the following baseline Security Groups for use with Thickness Monitoring and provides baseline family-level privileges for these groups:

- MI Thickness Monitoring Administrator
- MI Thickness Monitoring Inspector
- MI Thickness Monitoring User

Access to certain functions in GE Digital APM is determined by membership in these Security Groups. Note that in addition to the baseline family-level privileges that exist for these Security Groups, users will also need at least View privileges for all customer-defined predecessor or successor families that participate in the Thickness Monitoring relationships. Keep in mind that:

- Users who will need to create new records in TM will need Insert privileges to these families.
- Users who will need to modify records will need Update privileges to these families.
- Any user who should be allowed to delete TM records will need Delete privileges to these families.

The following table summarizes the functional privileges associated with each group.

Function	Can be done by members of the MI Thickness Monitoring Administrator Group?	Can be done by members of the MI Thickness Monitoring Inspector Group?	Can be done by members of the MI Thickness Monitoring User Group?
Configure Global Preferences	Yes	No	No
Configure Family Preferences	Yes	No	No
Use the T-Min Calculator	No	Yes	No
Archive Corrosion Rates	No	Yes	No
Reset the Maximum Historical Corrosion Rate	Yes	No	No
Exclude TMLs	No	Yes	No
Renew TMLs	No	Yes	No
Reset User Preferences	Yes	No	No

GE Digital APM provides the following baseline Security Groups for use with Thickness Monitoring and provides baseline family-level privileges for these groups:

- MI Thickness Monitoring Administrator
- MI Thickness Monitoring Inspector
- MI Thickness Monitoring User

Access to certain functions in GE Digital APM is determined by membership in these Security Groups. Note that in addition to the baseline family-level privileges that exist for these Security Groups, users will also need at least View privileges for all customer-defined predecessor or successor families that participate in the Thickness Monitoring relationships. Keep in mind that:

- Users who will need to create new records in TM will need Insert privileges to these families.
- Users who will need to modify records will need Update privileges to these families.
- Any user who should be allowed to delete TM records will need Delete privileges to these families.

The following table summarizes the functional privileges associated with each group.

Function	Can be done by members of the MI Thickness Monitoring Administrator Group?	Can be done by members of the MI Thickness Monitoring Inspector Group?	Can be done by members of the MI Thickness Monitoring User Group?
Configure Global Preferences	Yes	No	No
Configure Family Preferences	Yes	No	No
Use the T-Min Calculator	No	Yes	No
Archive Corrosion Rates	No	Yes	No
Reset the Maximum Historical Corrosion Rate	Yes	No	No
Exclude TMLs	No	Yes	No
Renew TMLs	No	Yes	No
Reset User Preferences	Yes	No	No

TM Security Groups

The following table lists the baseline Security Groups available for users within this module, as well as the baseline Roles to which those Security Groups are assigned.

Important: Assigning a Security User to a Role grants that user the privileges associated with all of the Security Groups that are assigned to that Role. To avoid granting a Security User unintended privileges, before assigning a Security User to a Role, be sure to review all of the privileges associated with the Security Groups assigned to that Role. Also, be aware that additional Roles, as well as Security Groups assigned to existing Roles, can be added via Security Manager.

Security Group	Roles
MI Thickness Monitoring Administrator	MI Mechanical Integrity Administrator
MI Thickness Monitoring Inspector	MI Mechanical Integrity Administrator MI Mechanical Integrity Power MI Mechanical Integrity User

Security Group	Roles
MI Thickness Monitoring User	MI Mechanical Integrity Administrator MI Mechanical Integrity Power MI Mechanical Integrity User
MI Thickness Monitoring Viewer	MI APM Viewer MI Mechanical Integrity Viewer

The baseline family-level privileges that exist for these Security Groups are summarized in the following table.

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Entity Families				
Corrosion	View, Update, Insert	View, Update, Insert	View, Update, Insert	View
Datapoint	View, Update, Insert	View, Update, Insert	View, Update, Insert	View
Datapoint Measurement	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert	View
Equipment	View	View	View	View
Human Resource	View, Update, Insert, Delete	View	View	View
Inspection Task	View	View, Update	View	View
Inventory Group Configuration	View	View	View	View
Materials of Construction	View	View	View	View
Meridium Reference Tables	View, Update, Insert, Delete	View	View	View
RBI Inspection Auto-Selection Criteria	View	View	View	View
Resource Role	View, Update, Insert, Delete	View	View	View
Security Group	View	View	View	View
Security User	View	View	View	View
Settings	View, Update, Insert	View, Update, Insert	View	View
Task Execution	View, Insert	View, Insert	View	View
Thickness Monitoring Task	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Relationship Families				
Belongs to a Unit	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View
Equipment Has Equipment	View	View	View	View
Group Assignment	View	View	View	View
Has Archived Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Subcomponent Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Subcomponent Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Datapoints	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Inspections	None	None	None	View
Has Measurements	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Roles	View, Update, Insert, Delete	View	View	View
Has Task Execution	View, Insert	View, Insert	View	View
Has Task Revision	View, Insert	View, Insert	View	View
Has Tasks	View, Insert	View, Insert	View, Insert	View
Has TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Is a User	View	View	View	View
User Assignment	View	View	View	View

The following table lists the baseline Security Groups available for users within this module, as well as the baseline Roles to which those Security Groups are assigned.

Important: Assigning a Security User to a Role grants that user the privileges associated with all of the Security Groups that are assigned to that Role. To avoid granting a Security User unintended privileges, before assigning a Security User to a Role, be sure to review all of the privileges associated with the Security Groups assigned to that Role. Also, be aware that additional Roles, as well as Security Groups assigned to existing Roles, can be added via Security Manager.

Security Group	Roles
MI Thickness Monitoring Administrator	MI Mechanical Integrity Administrator
MI Thickness Monitoring Inspector	MI Mechanical Integrity Administrator MI Mechanical Integrity Power MI Mechanical Integrity User
MI Thickness Monitoring User	MI Mechanical Integrity Administrator MI Mechanical Integrity Power MI Mechanical Integrity User
MI Thickness Monitoring Viewer	MI APM Viewer MI Mechanical Integrity Viewer

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Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Entity Families				
Corrosion	View, Update, Insert	View, Update, Insert	View, Update, Insert	View
Datapoint	View, Update, Insert	View, Update, Insert	View, Update, Insert	View
Datapoint Measurement	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert	View
Equipment	View	View	View	View
Human Resource	View, Update, Insert, Delete	View	View	View
Inspection Task	View	View, Update	View	View
Inventory Group Configuration	View	View	View	View
Materials of Construction	View	View	View	View
Meridium Reference Tables	View, Update, Insert, Delete	View	View	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
RBI Inspection Auto-Selection Criteria	View	View	View	View
Resource Role	View, Update, Insert, Delete	View	View	View
Security Group	View	View	View	View
Security User	View	View	View	View
Settings	View, Update, Insert	View, Update, Insert	View	View
Task Execution	View, Insert	View, Insert	View	View
Thickness Monitoring Task	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View
TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Relationship Families				
Belongs to a Unit	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View
Equipment Has Equipment	View	View	View	View
Group Assignment	View	View	View	View
Has Archived Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Subcomponent Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Subcomponent Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Datapoints	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Inspections	None	None	None	View
Has Measurements	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Has Roles	View, Update, Insert, Delete	View	View	View
Has Task Execution	View, Insert	View, Insert	View	View
Has Task Revision	View, Insert	View, Insert	View	View
Has Tasks	View, Insert	View, Insert	View, Insert	View
Has TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Is a User	View	View	View	View
User Assignment	View	View	View	View

Chapter

12

Reference

Topics:

General Reference

TM Data Model

The following diagram illustrates how families are related within the TM data model. In the following image, boxes represent entity families, and arrows represent relationship families that are configured in the baseline database.

Data Model

TM Security Groups

The following table lists the baseline Security Groups available for users within this module, as well as the baseline Roles to which those Security Groups are assigned.

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Security Groups assigned to that Role. Also, be aware that additional Roles, as well as Security Groups assigned to existing Roles, can be added via Security Manager.

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MI Thickness Monitoring Viewer	MI APM Viewer MI Mechanical Integrity Viewer

The baseline family-level privileges that exist for these Security Groups are summarized in the following table.

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Entity Families				
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Datapoint	View, Update, Insert	View, Update, Insert	View, Update, Insert	View
Datapoint Measurement	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert	View
Equipment	View	View	View	View
Human Resource	View, Update, Insert, Delete	View	View	View
Inspection Task	View	View, Update	View	View
Inventory Group Configuration	View	View	View	View
Materials of Construction	View	View	View	View
Meridium Reference Tables	View, Update, Insert, Delete	View	View	View
RBI Inspection Auto-Selection Criteria	View	View	View	View
Resource Role	View, Update, Insert, Delete	View	View	View
Security Group	View	View	View	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Security User	View	View	View	View
Settings	View, Update, Insert	View, Update, Insert	View	View
Task Execution	View, Insert	View, Insert	View	View
Thickness Monitoring Task	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View
TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
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Has Archived Subcomponent Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Datapoints	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Inspections	None	None	None	View
Has Measurements	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Roles	View, Update, Insert, Delete	View	View	View
Has Task Execution	View, Insert	View, Insert	View	View
Has Task Revision	View, Insert	View, Insert	View	View
Has Tasks	View, Insert	View, Insert	View, Insert	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Has TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Is a User	View	View	View	View
User Assignment	View	View	View	View

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MI Thickness Monitoring Viewer	MI APM Viewer MI Mechanical Integrity Viewer

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Entity Families				
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Datapoint	View, Update, Insert	View, Update, Insert	View, Update, Insert	View
Datapoint Measurement	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert	View
Equipment	View	View	View	View
Human Resource	View, Update, Insert, Delete	View	View	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Inspection Task	View	View, Update	View	View
Inventory Group Configuration	View	View	View	View
Materials of Construction	View	View	View	View
Meridium Reference Tables	View, Update, Insert, Delete	View	View	View
RBI Inspection Auto-Selection Criteria	View	View	View	View
Resource Role	View, Update, Insert, Delete	View	View	View
Security Group	View	View	View	View
Security User	View	View	View	View
Settings	View, Update, Insert	View, Update, Insert	View	View
Task Execution	View, Insert	View, Insert	View	View
Thickness Monitoring Task	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View
TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Relationship Families				
Belongs to a Unit	View, Update, Insert, Delete	View, Update, Insert	View, Update, Insert	View
Equipment Has Equipment	View	View	View	View
Group Assignment	View	View	View	View
Has Archived Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Subcomponent Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Archived Subcomponent Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Corrosion Analyses	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View

Family	MI Thickness Monitoring Administrator	MI Thickness Monitoring Inspector	MI Thickness Monitoring User	MI Thickness Monitoring Viewer
Has Corrosion Analysis Settings	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Datapoints	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Inspections	None	None	None	View
Has Measurements	View, Update, Insert, Delete	View, Update, Insert, Delete	View, Update, Insert, Delete	View
Has Roles	View, Update, Insert, Delete	View	View	View
Has Task Execution	View, Insert	View, Insert	View	View
Has Task Revision	View, Insert	View, Insert	View	View
Has Tasks	View, Insert	View, Insert	View, Insert	View
Has TML Group	View, Update, Insert, Delete	View, Update, Insert, Delete	View	View
Is a User	View	View	View	View
User Assignment	View	View	View	View

Field Mappings in the Default View of the TML Grid

In the **Analysis Overview** workspace, the grid in the **TMLs** section displays values in the following fields:

Field	Family
TML ID	Thickness Measurement Location
TML Asset ID	Thickness Measurement Location
Minimum Thickness	Thickness Measurement Location
Number of Readings	Thickness Measurement Location
Corrosion Rate	TML Corrosion Analysis
Remaining Life	TML Corrosion Analysis
Factor Remaining Life Date	TML Corrosion Analysis
Scheduled Next Inspection Date	TML Corrosion Analysis
Projected T-min Date	TML Corrosion Analysis
Last Measurement Value	TML Corrosion Analysis
Last Measurement Date	TML Corrosion Analysis
Near Measurement Value	TML Corrosion Analysis

The values in the **Remaining Life** column are calculated based on the current date and the value in the Projected T-Min Date field in the TML Corrosion Analysis family. This value is displayed in years.

About Allowable Stress

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About Color-Coding

Color-coding lets you see at a glance whether certain conditions exist for a given Thickness Measurement Location (TML) or Thickness Measurement. A color-coding category is assigned to each TML or Thickness Measurement based on the following criteria:

Category	Visual Cue	Criteria for a TML	Criteria for a Thickness Measurement
Below T-Min		The value in the Measurement Value field in the latest Thickness Measurement is less than the value in the Minimum Thickness field.	The value in the Measurement Value field is less than the value in the Minimum Thickness field in the associated TML.
Overdue		The value in the Scheduled Next Inspection Date or the Projected T-min Date field is earlier than the current date.	N/A
High Loss		The decrease in the measurement value of the latest Thickness Measurement compared to that of the previous one is greater than or equal to a specified percentage. **Note:** The default value is 30 percent. You can, however, modify this value.	The decrease in the measurement value of the latest Thickness Measurement compared to that of the previous one is greater than or equal to a specified percentage. **Note:** The default value is 30 percent. You can, however, modify this value.
Growth		The measurement value of the latest Thickness Measurement is greater than that of the previous one.	The measurement value of the latest Thickness Measurement is greater than that of the previous one.
Normal		The TML does not meet the criteria for any of the aforementioned categories.	The Thickness Measurement does not meet the criteria for any of the aforementioned categories.

Note: The values displayed in the **Measurements** section are rounded up to four decimal places. When assigning a color-coding category, instead of these rounded up values, the actual field values are considered.

These categories appear at the top of the **TMLs** section in the **Analysis Overview** workspace. The number in parentheses next to each category indicates the number of records that meet the criteria for each category. The visual cue appears in each row in the list of TMLs and Thickness Measurements.

Tip: You can filter the TMLs for each category by selecting the category at the top of the section. You can remove the filter by selecting the same category again.

Even if a TML or a Thickness Measurement meets the criteria for more than one category, only one color-code is assigned to each record, based on the following priority:

- Below T-Min
- Overdue
- High Loss
- Growth

Example: Color-Coding

Suppose a TML contains the following field values:

- **Minimum Thickness:** 1.2 inches
- **High Loss:** 10 percent (as specified on the **TM Admin Preferences** page)

Suppose the TML contains the following Thickness Measurements.

Measurement ID	Measurement Value (inches)
TM-1	1.34
TM-2	1.20

The following table describes the color-coding category that will be applied to each Thickness Measurement.

Measurement ID	Color-Coding Category	Reason
TM-1	Normal	The Measurement Value does not meet the criteria for any other categories.
TM-2	High Loss	The percentage of decrease between the latest Measurement Value (1.20 inches) and the previous one (1.34 inches) is greater than 10 percent.

Suppose you have created two more Thickness Measurements with the following Measurement Values:

Measurement ID	Measurement Value (inches)
TM-3	1.01
TM-4	1.21

The following table describes the color-coding category that will be applied to each Thickness Measurement.

Measurement ID	Color-Coding Category	Reason
TM-1	Normal	The Measurement Value does not meet the criteria for any other categories.
TM-2	Normal	Although the percentage of decrease in the Measurement Value (1.20 inches) from the previous one (1.34 inches) is greater than 10 percent, since this is no longer the latest Thickness Measurement, the category Normal is applied instead of High Loss.
TM-3	Below T-Min	The Measurement Value (1.01 inches) is less than Minimum Thickness (1.2 inches).
TM-4	Growth	The Measurement Value (1.21 inches) is greater than the previous one (1.01 inches).

Suppose the current date is December 31, 2017, and the TML Corrosion Analysis associated with the TML contains the following field values:

- **Scheduled Next Inspection Date**: January 01, 2018
- **Projected T-min Date**: January 02, 2018

For the TML, color-coding category is applied based on the following logic:

- **Below T-Min:** The value in the Measurement Value field (1.21 inches) of the latest Thickness Measurement (TM-4) is greater than the value in the Minimum Thickness field (1.2 inches). Therefore, the category Below T-Min is not applied to the TML.
- **Overdue:** The Scheduled Next Inspection Date (January 01, 2018) and the Projected T-Min Date (January 02, 2018) are later than the current date (December 31, 2017). Therefore, the category Overdue is not applied to the TML.
- **High Loss:** There is no decrease in the Measurement Value of the latest Thickness Measurement (1.21 inches) compared to that of the previous one (1.01 inches). Therefore, the category High Loss is not applied to the TML.
- **Growth:** The Measurement Value of the latest Thickness Measurement (1.21 inches) is greater than that of the previous one (1.01 inches). Therefore, the category Growth is applied to the TML.

About the Measurement Data Entry (MDE) Workspace

The Measurement Data Entry workspace is used for entering Thickness Measurement readings for multiple TMLs. It is divided into two areas: the common measurement data section, and the data entry grid.

Common Measurement Data

The common measurement data section appears at the top of the Measurement Data Entry workspace, and allows you to define values that will be distributed to cells in the corresponding columns for each Thickness Measurement Location (TML) listed in the data entry grid.

The Common Measurement Data section provides three boxes in which you can enter data:

- **Measurement Taken Date**
- **Measurement Taken By**

- **Temperature**

You can customize this section to make additional boxes available. Data entered in these boxes becomes the default value in the corresponding cell in each row.

Changes to the common measurement data section will not be applied to any rows in the data entry grid that already contain data.

Data Entry Grid

The data entry grid appears below the common measurement data section. The grid will be populated with one row for each TML linked to the record that you selected when accessing the Measurement Data Entry workspace.

By default, the grid is sorted in ascending order according to the value in the TML ID column.

Some TMLs will require you to enter multiple readings, as determined by the value in the Number of Readings field in a TML. You can enter multiple readings on the data entry grid by specifying the values separated by semi-colon or by selecting ••• in the row corresponding to a TML. A measurement value will be determined based on the readings.

TM Folder

Graphs

The Catalog folder **\\Public\Meridium\Modules\Thickness Monitoring\Graphs** contains the following items.

Item Name	Behavior and Usage
Corrosion Rate Dist	This graph appears on the **Thickness Monitoring Overview** page, and is based on the Corrosion Distribution query. It displays the corrosion rates of assets with calculated Asset Corrosion Analyses, ordered from highest rate of corrosion to lowest.
Remaining Life Less than 180 Months Graph	This graph appears on the **Thickness Monitoring Overview** page, and is based on the Remaining Life Less than 180 Months query. It displays the remaining life of assets with calculated Asset Corrosion Analyses, ordered from lowest remaining life to highest.

Queries

The Catalog folder **\\Public\Meridium\Modules\Thickness Monitoring\Queries** contains the following items.

Item Name	Behavior and Usage
Assets Near or Past Retirement	Used on the **Thickness Monitoring Overview** workspace to return a list of all assets with Asset Corrosion Analyses that are within 5 years of or past the retirement date. The list is displayed when you select the **Assets Near or Past Retirement Date** tab.
Assets with TM Tasks	Used on the **Thickness Monitoring Overview** workspace to return a list of all assets with Thickness Monitoring Tasks. The list is displayed in the **TM Tasks** box.
AvailableTMTasks	Returns all Thickness Monitoring Tasks related to the supplied assets.
Corrosion Distribution	Used to populate the data in the Corrosion Rate Distribution graph on the **Thickness Monitoring Overview** workspace.
Degradation Rates Greater than Expected	Used to populate the list in the Degradation Distribution box on the **Thickness Monitoring Overview** workspace.
Excessive Corrosion	Used on the **Thickness Monitoring Overview** workspace to return all assets with Asset Corrosion Analyses, and a Controlling Corrosion Rate greater than 20 Mils/year. The list is displayed when you select the **Excessive Corrosion** tab.
Measurement Input Reference	Returns TMLs and additional reference data used for entering Thickness Measurements in the **Measurement Data Entry** workspace.
Measurements Near or Less than T-Min	Used on the **Thickness Monitoring Overview** workspace to return all assets with measurements that fall within 10 Mils or less of T-Min.
Remaining Life Less than 180 Months	Used to populate the data in the Remaining Life graph on the **Thickness Monitoring Overview** workspace.
Thickness Inspections	Used on the **Thickness Monitoring Overview** workspace to return all assets with a Next Inspection Date, including past dates. This list is displayed when you select the **Thickness Inspections** tab.
TM Assets	Used on the **Thickness Monitoring Overview** workspace to display a list of all assets with Thickness Monitoring data linked to the selected Functional Location.
TM Assets Requiring a Calculation	Used on the **Thickness Monitoring Overview** workspace to display a list of all assets with Asset Corrosion Analyses that must be recalculated. This list is displayed when you select the Assets Requiring a Calculation **Assets Requiring a Calculation** tab.
TM Overview Filter Parameters	None
TML Groups for an Asset	Returns a list of all TML Groups linked to the selected asset.
TMLs for an Asset	Returns a list of all TMLs linked to the selected asset or TML Group.

TM Rules Lookup

Thickness Monitoring includes a set of baseline Thickness Monitoring Rules Lookup records and the associated Rules Library projects. You can use the baseline records as they are delivered, or you can modify them to suit your specific needs. Like all reference table records, Thickness Monitoring Rules Lookup records are best viewed through a query. You can manage Thickness Monitoring Rules Lookup records via the **TM Admin Preferences** page.

Thickness Monitoring Rules

The following table provides a list of the fields that exist in the Thickness Monitoring Rules Lookup family, descriptions of these fields, and information about any corresponding Thickness Measurement Location (TML) fields.

Field Name	Field Description	Corresponding TML Field
Asset Type	Contains a value that identifies the type of equipment to which a TML is linked. The value in this field determines which values are available in the Design Code field. For example, when Piping is selected in the Asset Type field, only piping design codes will appear in the Design Code field.	This field exists simply to facilitate the creation of new Thickness Monitoring Rules Lookup records by filtering values in the Design Code field.
Code Year	Contains a list of years associated with the selected Design Code.	Code Year (T-Min Formula)
Design Code	Contains a list of design codes that are appropriate for the equipment type selected in the Asset Type field.	Design Code
Component Type	Contains a list of component types.	Determined by the equipment type, which is derived from the value in the Design Type field, and can be any of the following fields: • Vessel Type for Pressure Vessel TMLs. • Tank Type for Tank TMLs. • No Mapping for Piping TMLs.
Formula Classification	Contains a list of formula classifications.	Determined by the equipment type, which is derived from the value in the Design Type field, and can be any of the following fields: • Piping Formula for Piping TMLs. • PV Formula for Pressure Vessel TMLs. • No Mapping for Tank TMLs.

Field Name	Field Description	Corresponding TML Field
T-Min Formula Rule	Contains a reference to a project in the Rules Library.	This value is derived for each TML based on values in other fields. Although the derived value is not stored in the TML itself, it identifies the formula that will be used to determine the Calculated T-Min value for a TML.
MAWP Formula Rule	Contains a reference to a project in the Rules Library.	This value is derived for each TML based upon values in other fields. Although the derived value is not stored in the TML itself, it is used to determine the Maximum Allowable Working Pressure value for a TML.

Default Datalogger Settings

This following table provides a list of default settings for each datalogger. You must review them and modify if needed before sending or receiving data from a datalogger.

Datalogger	Connection Type	Baud Rate	COM Port	Datalogger Service Port
GE DMS Go	USB	N/A	N/A	2014
GE DMS Go+	USB	N/A	N/A	2014
GE DMS2	Serial	Per Device Setting	COM1	2014
Olympus (Panametrics) 37DL Plus Ultrasonic Thickness Gage	Serial	1200	COM1	2014
Olympus (Panametrics) 38DL Plus Ultrasonic Thickness Gage	USB	N/A	N/A	2014

Note: The Olympus (Panametrics) 38DL Plus Ultrasonic Thickness Gage also supports the serial connection type. When you set the Connection Type to Serial, the Olympus (Panametrics) 38DL Plus Ultrasonic Thickness Gage uses the same default settings as the Olympus (Panametrics) 37DL Plus Ultrasonic Thickness Gage.

Limitations When Using Dataloggers

This topic provides a list of limitations when using each type of datalogger.

GE DMS Go and GE DMS Go+

- You must specify a directory in the **File Directory** box. Files will be sent to and received from the **Meridium** folder that is created in the specified directory.
- The GE DMS Go and GE DMS Go+ devices use only the first 32 characters of the file name that is used to send data. If the file name is longer than 32 characters, a message appears, specifying the original item name and the truncated item name.

  If multiple files are sent to the device, and the first 32 characters of the file names are the same, then a single file will be created on the device using the first 32 characters, which stores the data in all the files.

- The GE DMS Go and GE DMS Go+ devices use only the first 16 characters of the TML ID. If the TML ID is longer than 16 characters, a message appears, specifying that the TML ID will be truncated to 16 characters.

  Important: Because of the truncation, if duplicate TML IDs are created in the device, it collects data from both the locations. However, while receiving the data, it updates the data only for the first TML ID.

GE DMS2

- The GE DMS2 device uses only the first 32 characters of the file name that is used to send data. If the file name is longer than 32 characters, a message appears, specifying the original item name and the truncated item name.

  If multiple files are sent to the device, and the first 32 characters of the file names are the same, then a single file will be created on the device using the first 32 characters, which stores the data in all the files.

- The GE DMS2 device uses only the first 16 characters of the TML ID. If the TML ID is longer than 16 characters, a message appears, specifying that the TML ID will be truncated to 16 characters.

  Important: Because of the truncation, if duplicate TML IDs are created in the device, it collects data from both the locations. However, while receiving the data, it updates the data only for the first TML ID.

Olympus (Panametrics) 37DL Plus Ultrasonic Thickness Gage

- The Olympus (Panametrics) 37DL Plus Ultrasonic Thickness Gage does not accept Asset IDs containing lowercase characters.

Olympus (Panametrics) 38DL Plus Ultrasonic Thickness Gage

- The Olympus (Panametrics) 38DL Plus Ultrasonic Thickness Gage does not accept Asset IDs containing lowercase characters.

TM URLs

There is one URL route associated with Thickness Monitoring: **tm**. The following table describes the various paths that build on the route, and the elements that you can specify for each.

Tip: For more information, refer to the URLs section of the documentation.

Element	Description	Accepted Value(s)	Notes
tm/unit: Opens the **Thickness Monitoring Overview** workspace. **tm/unit/<UnitEntityKey>**: Displays the selected unit on the **Thickness Monitoring Overview** workspace.			
<UnitEntityKey>	Specifies the Functional Location or Unit you want to view in TM.	Any Entity Key that corresponds to a Unit or Functional Location.	Required.
tm/asset/<AssetEntityKey>: Displays the selected asset in the **Analysis Overview** workspace. **tm/asset/<AssetEntityKey>/settings**: Displays the selected asset in the **Corrosion Analysis Settings** workspace. **tm/asset/<AssetEntityKey>/input**: Displays the selected asset in the **Measurement Data Entry** workspace.			
<AssetEntityKey>	Specifies the asset you want to view in TM.	Any Entity Key that corresponds to an asset.	Required.

Element	Description	Accepted Value(s)	Notes
tm/asset/<AssetEntityKey>/subcomponent/<TMLGroupEntityKey>: Displays the selected TML Group in the **Analysis Overview** workspace. **tm/asset/<AssetEntityKey>/subcomponent/<TMLGroupEntityKey>/settings**: Displays the selected TML Group in the **Corrosion Analysis Settings** workspace. **tm/asset/<AssetEntityKey>/subcomponent/<TMLGroupEntityKey>/input**: Displays the selected TML Group in the **Measurement Data Entry** workspace.			
<TMLGroupEntityKey>	Specifies a TML Group linked to an asset that you want to view in TM.	Any Entity Key that corresponds to a TML Group.	Required.
tm/asset/<AssetEntityKey>/tml/<TMLEntityKey>: Displays the selected TML in the **Analysis Overview** workspace. **tm/asset/<AssetEntityKey>/tml/<TMLEntityKey>/settings**: Displays the selected TML in the **Corrosion Analysis Settings** workspace.			
<UnitEntityKey>	Specifies a TML linked to an asset that you want to view in TM.	Any Entity Key that corresponds to a TML.	Required.

Example URLs

Example URL	Destination
tm/unit	The **Thickness Monitoring Overview** workspace.
tm/unit/2305330	The **Thickness Monitoring Overview** workspace for the specified unit.
tm/asset/2509505	The **Analysis Overview** workspace for the specified asset.
tm/asset/2509505/settings	The **Corrosion Analysis Settings** workspace for the specified asset.
tm/asset/2509505/input	The **Measurement Data Entry** workspace for the specified asset.
tm/asset/2509505/subcomponent/3476094	The **Analysis Overview** workspace for the TML Group with Entity Key 3476094, which is linked to the asset with Entity Key 2509505.
tm/asset/2509505/subcomponent/3476094/settings	The **Corrosion Analysis Settings** workspace for the TML Group with Entity Key 3476094, which is linked to the asset with Entity Key 2509505.
tm/asset/2509505/subcomponent/3476094/input	The **Measurement Data Entry** workspace for the TML Group with Entity Key 3476094, which is linked to the asset with Entity Key 2509505.
tm/asset/2509505/tml/6225073	The **Analysis Overview** workspace for the TML with Entity Key 6225073, which is linked to the asset with Entity Key 2509505.
tm/asset/2509505/tml/6225073/settings	The **Corrosion Analysis Settings** workspace for the TML with Entity Key 6225073, which is linked to the asset with Entity Key 2509505.

TM System Code Tables

The following table lists the System Code Tables used to support various functions throughout Thickness Monitoring.

Table ID	Table Description	Usage
CITP	Corrosion Inspection Type	Populates the Corrosion Inspection Type field in Corrosion Analysis Settings. You can modify the System Codes in this System Code Table if you want to use custom TML Analysis Types.
CRAM	Corrosion Analysis Methods	Unknown
DPAC	Datapoint Access	Populates the Access field in TMLs.
DPCN	Datapoint Condition	Unknown
DPCR	Datapoint Corrosion Analysis Methods	Populates the Corrosion Rate Options in Corrosion Analysis Settings.
DPIN	Datapoint Insulation	Unknown
DPTP	Datapoint Type	Unknown
DSCD	Design Code	Populates the Design Code list in TMLs.
INST	Inspection Status Code	Unknown
INSM	Inspection Interval Types	Unknown
MI ASSET TYPE	Asset Type	Populates the Asset Type list in Thickness Monitoring Rules Lookup records.
MI RESOURCE ROLE	List of user roles	Populates the Role list in Resource Role records.
MI STATUS INDICATOR	TML Status Indicator	Populates the Status Indicator list in TMLs.
PIPFMU	Pipe Formula	Populates the Formula Classification list in Thickness Monitoring Rules Lookup records.
PVFMU	Pressure Vessel Formula	Populates the Formula Classification list in Thickness Monitoring Rules Lookup records.
SLCR	Straight Line Corrosion Methods	Unknown
T MIN CUSTOM EQUATIONS	T-Min Calculator Custom Equations	Unknown.
STCR	Statistical Corrosion Methods	Unknown

Table ID	Table Description	Usage
TNKT	Tank Type	Populates the Component Type list in Thickness Monitoring Rules Lookup records.
VSTP	Vessel Type	Populates the Component Type list in Thickness Monitoring Rules Lookup records.

Other standard System Code Tables, such as UOME, MATG, and MATL, are also used in Thickness Monitoring.

TM Site Filtering

All of the families included in the Thickness Monitoring module employ the GE Digital APM **Site** Control. This means that you can access or modify only the records in TM that are assigned to the same site to which you are assigned.

Tip: For more information, refer to the Site Filtering section of the documentation.

Example: Viewing TMLs

Consider an organization that has three sites, Site X, Site Y, and Site Z.

- TML A: Assigned to Site X
- TML B: Assigned to Site Y
- TML C: Assigned to Site Z
- TML D: No site assigned (global record)

    Note: A global record in TM only occurs if there was an error in the data load or if the site location was changed by a Super User. Global records are not recommended Best Practices in TM.

Scenario 1: User assigned to only Site X

When this user accesses the TMLs from an analysis, he or she will see:

- TML A
- TML D

Scenario 2: User assigned to both Site X and Site Y

When this user accesses the TMLs from an analysis, he or she will see:

- TML A
- TML B
- TML D

Scenario 3: Super User

When this user accesses the TMLs from an analysis he or she will see:

- TML A
- TML B
- TML C
- TML D

Family Field Descriptions

Thickness Monitoring Analyses, Corrosion Analysis Settings, and Tasks

The following tables provide lists of various fields that are defined for the Asset Corrosion Analysis, TML Corrosion Analysis, and Corrosion Analysis Settings families in the baseline GE Digital APM database. Depending on how your system has been configured, additional fields may be available in the families, and some fields may not behave exactly as described in the table.

Note: Although the fields are listed in alphabetical order in the tables, they will appear in a different order in the application. This list is not comprehensive. Baseline fields that are not displayed in the application are omitted. Certain datasheets may be divided into tabs.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will then only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

Asset Corrosion Analysis

Each Asset Corrosion Analysis contains read-only fields that store calculations and summary information. This data is derived from the TML Corrosion Analyses that are linked to the TMLs for the asset or TML Group. The following table provides an alphabetical list of the fields that are visible on the tabs of an Asset Corrosion Analysis datasheet.

Field	Data Type	Description	Behavior and Usage
Analysis ID	Character	Identifies the Asset Corrosion Analysis.	Always disabled. The Analysis ID is created automatically, and consists of the ID from the related asset or TML Group, the Analysis Type, and the text Corrosion Analysis.
Analysis Required	Boolean	When selected, indicates that data has changed such that the analysis must be recalculated.	Always disabled. The check box in this field is selected automatically by Thickness Monitoring. It is cleared when the analysis is calculated.

Field	Data Type	Description	Behavior and Usage
Asset Calc Adjusted Next Insp Date	Date	Specifies the date of the next required inspection of the asset or TML Group, based on the Asset Average Corrosion Rate.	Always disabled. This field is populated with the most conservative (i.e., earliest) date from the Asset Average Corrosion Rate Next Inspection Date fields in the TML Corrosion Analyses linked to the analysis. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.
Asset Calc Adjusted Remaining Life	Numeric	Specifies the remaining life of the asset or TML Group, based on the Asset Average Corrosion Rate.	Always disabled. This field is populated with the most conservative (i.e., lowest) value from the Asset Average Corrosion Rate Remaining Life fields in the TML Corrosion Analyses linked to the analysis. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.

Field	Data Type	Description	Behavior and Usage
Asset Calc Adjusted Retire Date	Date	Specifies the recommended retirement date for the asset or TML Group, based on the Asset Average Corrosion Rate.	Always disabled. This field is populated with the most conservative (i.e., earliest) date from the Asset Average Corrosion Rate Retirement Date fields in the TML Corrosion Analyses linked to the analysis. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.
Asset Calculated Next Insp Date	Date	Specifies the date of the next required inspection of the asset or TML Group.	Always disabled. This field is populated with the most conservative (i.e., earliest) date from the Scheduled Next Inspection Date fields in the TML Corrosion Analyses linked to the analysis.
Asset Calculated Remaining Life	Numeric	Specifies the remaining life of the asset or TML Group.	Always disabled. This field is populated with the most conservative (i.e., lowest) value from the Remaining Life fields in the TML Corrosion Analyses linked to the analysis.
Asset Calculated Retire Date	Date	Specifies the recommended retirement date for the asset or TML Group.	Always disabled. This field is populated with the most conservative (i.e., earliest) date from the Retirement Date fields in the TMLs linked to the analysis.

Field	Data Type	Description	Behavior and Usage
Average Corrosion Rate	Numeric	Specifies the average rate at which the asset or TML Group is corroding.	Always disabled. By default, this field is calculated by taking the sum of the Corrosion Rates for all TML Corrosion Analyses linked to the analysis, and dividing it by the number of linked TMLs. The value in this field may change based on the following options in the related Corrosion Analysis Settings: • Safety Factor • Minimum Number of TMLs • Percentile
Average Corrosion Rate Standard Deviation	Number	Numeric	None.
Average Corrosion Rate TML's Used	Text	Stores a list of TMLs that were used for calculating the Average Corrosion Rate for the Asset Corrosion Analysis.	Always disabled. This list is used to construct the Based on list of TMLs that appear as links in the **Summary** section of the **Analysis Output** workspace for the asset or TML Group.
Controlling Corrosion Rate	Numeric	Specifies the corrosion rate of the asset or TML Group.	Always disabled. This field is determined using the corrosion rates that exist for the TMLs linked to the analysis, and the Controlling Corrosion Rate option (Average, Formula, or Maximum) selected in the related Corrosion Analysis Settings.
Corrosion Inspection Type	Character	Specifies the type of inspection (UT, RT, or TML) for the Asset Corrosion Analysis.	Always disabled. This field is populated automatically based on the related Corrosion Analysis Settings. Only data from linked TML Corrosion Analyses with a Corrosion Inspection Type that matches this field will be used with this analysis.

Field	Data Type	Description	Behavior and Usage
Estimated Remaining Life	Numeric	Specifies the remaining life of the asset or TML Group.	Always disabled. In the related Corrosion Analysis Settings, if the **Apply CCR to TML Rem Life Next Insp Date Calc** check box is selected, this field is populated with the value in the Asset Calc Adjusted Remaining Life field. Otherwise, this field is populated with the value in the Asset Calculated Remaining Life field.
Last Date / Time Analysis Calculated	Date	Specifies the date and time when the analysis was last calculated.	Always disabled. This field is populated automatically when the analysis is calculated.
Maximum Allowable Working Pressure	Numeric	Specifies the Maximum Allowable Working Pressure for the asset or TML Group.	Always disabled. This field is populated with the most conservative (i.e., lowest) value from the Maximum Allowable Working Pressure fields in the TML Corrosion Analyses linked to the analysis.
Maximum Corrosion Rate	Numeric	Specifies the highest rate at which the asset or TML Group is corroding.	Always disabled. This field is populated with the highest rate from the Corrosion Rate fields in the TML Corrosion Analyses linked to the analysis.
Maximum Historical Corrosion Rate	Numeric	Specifies the highest corrosion rate that has ever been calculated for any TML that is linked to analysis.	Always disabled. When the analysis is recalculated, this field is only updated if the value in the Controlling Corrosion Rate field for any TML Corrosion Analysis linked to the analysis exceeds the current value of this field. If the value in this field is exceeded by the Controlling Corrosion Rate from multiple TML Corrosion Analyses, only the highest value is used to populate this field.

Field	Data Type	Description	Behavior and Usage
Projected T-min Date	Date	Specifies the recommended retirement date for the asset or TML Group.	Always disabled. In the related Corrosion Analysis Settings, if the **Apply CCR to TML Rem Life Next Insp Date Calc** check box is selected, this field is populated with the value in the Asset Calc Adjusted Retire Date field. Otherwise, this field is populated with the value in the Asset Calculated Retire Date field.
Scheduled Next Date Asset	Date	Specifies the date of the next required inspection of the asset or TML Group.	Always disabled. In the related Corrosion Analysis Settings, if the **Apply CCR to TML Rem Life Next Insp Date Calc** check box is selected, this field is populated with the value in the Asset Calc Adjusted Next Insp Date field. Otherwise, this field is populated with the value in the Asset Calculated Next Insp Date field.
Statistical Corrosion Rate	Numeric	Specifies an average corrosion rate that is calculated after eliminating certain TMLs that are identified as statistical outliers.	Always disabled. This field is calculated by performing a statistical analysis of the Corrosion Rates for all TML Corrosion Analyses linked to the analysis.
Statistical Corrosion Rate TMLs Used	Text	Stores a list of TMLs that were used for calculating the Statistical Corrosion Rate for the Asset Corrosion Analysis.	Always disabled.

TML Corrosion Analysis

For each TML linked to an asset or TML Group, a TML Corrosion Analysis is created. Fields in the TML Corrosion Analysis are read-only and are updated based on calculations for the TML and any related Thickness Measurements. The following table provides an alphabetical list of the fields that are visible on the TML Corrosion Analysis datasheet.

Field	Data Type	Description	Behavior and Usage
Allowable Measurement Variance Applied	Boolean	When selected, indicates that the Allowable Measurement Variance has been used to determine the Short Term Corrosion Rate.	Always disabled. The check box in this field is selected automatically if the Allowable Measurement Variance has been used to calculate the value in the Short Term Corrosion Rate field.
Analysis ID	Character	Identifies the TML Corrosion Analysis.	Always disabled. The Analysis ID is created automatically, and consists of the ID of the TML, the Corrosion Inspection Type, and the text Corrosion Analysis.
Analysis Required	Boolean	When selected, indicates that data has changed such that the analysis must be recalculated.	Always disabled. The check box in this field is selected automatically by Thickness Monitoring. It is cleared when the analysis is calculated.
Asset Average Corrosion Rate	Numeric	Specifies the average corrosion rate for the asset or TML Group, calculated using the Controlling Corrosion Rate from all linked TML Corrosion Analyses.	Always disabled. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.
Asset Average Corrosion Rate Next Inspection Date	Date	Specifies the date of the next required inspection, based on the Asset Average Corrosion Rate Remaining Life.	Always disabled. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.

Field	Data Type	Description	Behavior and Usage
Asset Average Corrosion Rate Remaining Life	Numeric	Specifies the remaining life for the TML, based on the Asset Average Corrosion Rate.	Always disabled. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.
Asset Average Corrosion Rate Retirement Date	Date	Specifies the recommended retirement date for the TML, based on the Asset Average Corrosion Rate Remaining Life.	Always disabled. This field is populated only if the Controlling Corrosion Rate setting in the related Corrosion Analysis Settings has been set to Average or Formula, and the Apply CCR to TML Rem Life Next Insp Date Calc check box was selected at the same time.
Base Measurement Date	Date	Specifies the date the Thickness Measurement used for the Base Measurement Value was taken.	Always disabled. If the Base Measurement Value field is populated, this field is populated with the Measurement Taken Date for the Thickness Measurement used as the Base Measurement.
Base Measurement Value	Numeric	Specifies the value of the Thickness Measurement that was recorded first based on the value in the Measurement Taken Date field.	Always disabled. This field is populated when at least one Thickness Measurement has been recorded for the TML.
Corrosion Inspection Type	Character	Specifies the type of inspection (UT, RT, or TML) for the TML Corrosion Analysis.	Always disabled. This field is populated automatically based on the related Corrosion Analysis Settings.

Field	Data Type	Description	Behavior and Usage
Corrosion Rate	Numeric	Specifies the maximum corrosion rate of the calculated corrosion rates selected in the related Corrosion Analysis Settings.	Always disabled. This field is populated with the value of the highest calculated corrosion rate. Only the corrosion rates selected in the asset Corrosion Analysis Settings are calculated. In the **Analysis Output** section of the **Analysis Overview** workspace for a TML, this corresponds to the Controlling Corrosion Rate. If Thickness Measurements are not available and corrosion rates cannot be calculated, this field will be populated with the Minimum Corrosion Rate defined in the related Corrosion Analysis Settings.
Custom Calculation A Corrosion Rate	Numeric	Specifies the corrosion rate determined by custom corrosion rate A, as defined in the TM Admin Preferences.	Always disabled. The values in this table correspond to the baseline field and datasheet captions that exist for these fields. These captions are not dynamic based upon the label specified for the corrosion rates in the application settings. If you want these captions to match the custom labels that you have defined for these calculations, you will need to customize the captions via the Configuration Manager application.

Field	Data Type	Description	Behavior and Usage
Custom Calculation A Loss	Numeric	Specifies the amount of corroded material calculated by custom corrosion rate A, as defined in the TM Admin Preferences.	Always disabled. The values in this table correspond to the baseline field and datasheet captions that exist for these fields. These captions are not dynamic based upon the label specified for the corrosion rates in the application settings. If you want these captions to match the custom labels that you have defined for these calculations, you will need to customize the captions via the Configuration Manager application. This feature is only available in the on-premises version of GE Digital APM.
Custom Calculation B Corrosion Rate	Numeric	Specifies the corrosion rate determined by custom corrosion rate B, as defined in the application settings.	Always disabled. The values in this table correspond to the baseline field and datasheet captions that exist for these fields. These captions are not dynamic based upon the label specified for the corrosion rates in the application settings. If you want these captions to match the custom labels that you have defined for these calculations, you will need to customize the captions via the Configuration Manager application. This feature is only available in the on-premises version of GE Digital APM.

Field	Data Type	Description	Behavior and Usage
Custom Calculation B Loss	Numeric	Specifies the amount of corroded material calculated by custom corrosion rate B, as defined in the application settings.	Always disabled. The values in this table correspond to the baseline field and datasheet captions that exist for these fields. These captions are not dynamic based upon the label specified for the corrosion rates in the application settings. If you want these captions to match the custom labels that you have defined for these calculations, you will need to customize the captions via the Configuration Manager application. This feature is only available in the on-premises version of GE Digital APM.
Custom Rate A Retirement Date	Date	Specifies the recommended retirement date for the TML, based on custom corrosion rate A.	Always disabled. This field is determined using the value in the Custom Calculation A Corrosion Rate field. This feature is only available in the on-premises version of GE Digital APM.
Custom Rate B Retirement Date	Date	Specifies the recommended retirement date for the TML, based on custom corrosion rate B.	Always disabled. This field is determined using the value in the Custom Calculation B Corrosion Rate field. This feature is only available in the on-premises version of GE Digital APM.
Factor Remaining Life Date	Date	Specifies a date based on the Remaining Life Factor in the related Corrosion Analysis Settings.	Always disabled. When the associated TML is below T-Min, this field is populated with the value in the Last Measurement Date field. When the associated TML is not below T-Min, a calculation is used to determine the date with which this field is populated.

Field	Data Type	Description	Behavior and Usage
Interval Next Inspection Date	Date	Specifies the date of the next required inspection for the TML.	Always disabled. This field is populated with a date based on the Default Inspection Interval in the related Corrosion Analysis Settings.
Last Measurement Date	Date	Specifies the date the Thickness Measurement used for the Last Measurement Value was taken.	Always disabled. If the Last Measurement Value field is populated, this field is populated with the Measurement Taken Date for the Thickness Measurement used as the Last Measurement.
Last Measurement Value	Numeric	Specifies the value of the Thickness Measurement that was recorded last based on the value in the Measurement Taken Date field.	Always disabled. This field is populated when at least two Thickness Measurements have been recorded for the TML.
Least Squares Corrosion Rate	Numeric	Specifies a value that represents the corrosion rate that was determined using the Least Squares linear regression method. **Note:** The Least Squares method plots the thickness measurements for the TML and then draws a line that minimizes the sum of the squares of the offsets of the datapoints. The Least Squares Corrosion Rate represents the slope of the line on the plot.	Always disabled. This field is populated only if the Least Squares option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.
Least Squares Retirement Date	Date	Specifies the recommended retirement date for the TML, based on the Least Squares Corrosion Rate.	Always disabled. This field is populated only if the Least Squares option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.

Field	Data Type	Description	Behavior and Usage
Long Term Corrosion Rate	Numeric	Specifies a value that represents the corrosion rate over the time between the first and last measurements.	Always disabled. The rate of corrosion between the Base Measurement Value and the Last Measurement Value is calculated using the following equation: **Long Term Corrosion Rate = Long Term Loss / Long Term Interval** This field is populated only if the Long Term option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.
Long Term Loss	Numeric	Specifies the amount of material that was corroded over the time between the first and last measurements.	Always disabled. The amount of material corroded between the Base Measurement Value and the Last Measurement Value is calculated using the following equation: Long Term Loss = Base Measurement Value - Last Measurement Value This field is populated only if the Long Term option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.
Long Term Retirement Date	Date	Specifies the recommended retirement date for the TML, based on the Long Term Corrosion Rate.	Always disabled. This field is populated only if the Long Term option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.
Maximum Allowable Working Pressure	Numeric	Specifies the maximum pressure at which the associated asset is designed to operate.	Always disabled. This field is populated only if the TML contains the data necessary to perform the calculation, and only for assets or TML Groups that represent pipes or components that make up pipes.

Field	Data Type	Description	Behavior and Usage
Maximum Historical Corrosion Rate	Numeric	Specifies the highest corrosion rate calculated during the life of the TML. The Maximum Historical Corrosion Rate may come from any of the calculated corrosion rates.	Always disabled. When the analysis is recalculated, this field is only updated if one of the calculated corrosion rates that is selected in the related Corrosion Analysis Settings exceeds the current value in this field.
Minimum Corrosion Rate Used	Boolean	When selected, indicates the value in the Corrosion Rate field has been set to the Minimum Corrosion Rate value defined in the related Corrosion Analysis Settings.	Always disabled. The check box in this field is selected automatically when the Minimum Corrosion Rate value is used to populate the Corrosion Rate field.
Near Measurement Date	Date	Specifies the date the Thickness Measurement used for the Near Measurement Value was taken.	Always disabled. If the Near Measurement Value field is populated, this field is populated with the Measurement Taken Date for the Thickness Measurement used as the Near Measurement.
Near Measurement Value	Numeric	Specifies the value of the Thickness Measurement that was recorded next-to-last based on the value in the Measurement Taken Date field.	Always disabled. This field is populated when at least two Thickness Measurements have been recorded for the TML.
Projected T-min Date	Date	Specifies the date when the TML will reach its minimum thickness.	Always disabled. This field is calculated using the current rate of corrosion and the T-Min value for the TML.
Remaining Life	Numeric	Specifies in the months the remaining life of the TML after the date of the last measurement recorded.	Always disabled. This field is calculated using the current rate of corrosion and the T-Min value for the TML.

Field	Data Type	Description	Behavior and Usage
Scheduled Next Inspection Date	Date	Specifies the date of the next suggested inspection of the TML.	Always disabled. If both the Interval Next Inspection Date and Factor Remaining Life Date fields are populated, this field will be populated with the most conservative (i.e., earliest) of the two dates. If only the Interval Next Inspection Date or Factor Remaining Life field is populated, this field will be populated with the date from that field. If neither the Interval Next Inspection Date or Factor Remaining Life fields are populated, this field will be populated with the date from the Projected T-Min Date field.
Short Term Corrosion Rate	Numeric	Specifies a value that represents the corrosion rate over the time between the next-to-last and last measurements.	Always disabled. The rate of corrosion between the Near Measurement Value and the Last Measurement Value is calculated using the equation: Short Term Corrosion Rate = Short Term Loss / Short Term Interval This field is populated only if the Short Term option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.

Field	Data Type	Description	Behavior and Usage
Short Term Loss	Numeric	Specifies the amount of material that was corroded over the time between the next-to-last and last measurements.	Always disabled. The amount of material that is corroded between the Near Measurement Value and the Last Measurement Value is calculated using the following equation: Short Term Loss = Near Measurement Value - Last Measurement Value This field is populated only if the Short Term option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.
Short Term Retirement Date	Date	Specifies the recommended retirement date for the TML, based on the Short Term Corrosion Rate.	Always disabled. This field is populated only if the Short Term option for the Corrosion Rate Options setting is selected in the related Corrosion Analysis Settings.
Verify Measurements	Character	When the value in this field is Yes, indicates that linked Thickness Measurements require manual verification.	Always disabled. This field is populated automatically if the Measurement Value field in linked Thickness Measurements requires manual verification based upon the Corrosion Rate Variance validation.

Corrosion Analysis Settings

Each Asset and TML Corrosion Analysis has a set of related Corrosion Analysis Settings. In the case of TML Corrosion Analyses, most values in the Corrosion Analysis Settings are inherited from the settings specified for the asset or TML Group to which the TML is linked. When you create or modify Corrosion Analysis Settings, you are viewing a representation of the Corrosion Analysis Settings datasheet linked to the Asset or TML Corrosion Analysis.

It is recommended that you only access the datasheet in the context of the Corrosion Analysis Settings Workspace. The following table provides an alphabetical list of the fields that are visible on the Corrosion Analysis Settings workspace.

Corrosion Analysis Settings are accessible via an asset or TML Group, or via a TML. The table refers to the former as the asset level, and the latter as the TML level.

Field	Data Type	Description	Behavior and Usage
Allowable Measurement Variance	Numeric	Specifies a value for the amount of variation that is allowed between values in the Measurement Value fields of the two most recent Thickness Measurements linked to the related TML.	This field is used to validate measurement data. The value in this field is only considered if it is greater than 0.
Apply CCR to TML Rem Life Next Insp Date Calc	Boolean	When selected, indicates that Asset and TML Corrosion Analyses will use adjusted values for determining corrosion rate, remaining life, and next inspection dates.	This field is only considered if the Controlling Corrosion Rate is set to Average or Formula. When the check box in this field is selected, in an Asset Corrosion Analysis, the following occurs: • The Asset Controlling Next Insp Date field is set to the value of the Asset Calc Adjusted Next Insp Date field. • The Asset Controlling Remaining Life field is set to the value of the Asset Calc Adjusted Remaining Life field. • The Asset Controlling Retire Date is set to the value of the Asset Calc Adjusted Retire Date field. When the check box in this field is selected, in a TML Corrosion Analysis the following fields are populated, if possible: • Asset Average Corrosion Rate • Asset Average Corrosion Rate Next Inspection Date • Asset Average Corrosion Rate Remaining Life • Asset Average Corrosion Rate Retirement Date
Comments	Text	Stores comments.	This field is not visible at the TML level.

Field	Data Type	Description	Behavior and Usage
Controlling Corrosion Rate	Character	Specifies the method (Maximum, Average, or Formula) by which a corrosion rate will be calculated for the asset.	This field is disabled at the TML level. Required. When Average is selected, in the related Asset Corrosion Analysis, the Controlling Corrosion Rate field will be populated with the value in the Average Corrosion Rate field. Additionally, when Average is selected, the following fields appear: • Apply CCR to TML Rem Life Next Insp Date Calc • Safety Factor • Minimum Number of TMLs • Percentile When Formula is selected, in the related Asset Corrosion Analysis, the Controlling Corrosion Rate field will be populated with the value in the Statistical Corrosion Rate field. Additionally, when Formula is selected, the Apply CCR to TML Rem Life Next Insp Date Calc field appears. When Maximum is selected, in the related Asset Corrosion Analysis, the Controlling Corrosion Rate field will be populated with the value in the Maximum Corrosion Rate field. By default, when you create Corrosion Analysis Settings, Maximum is selected.

Field	Data Type	Description	Behavior and Usage
Corrosion Rate Options	Boolean	Indicates which corrosion rates will be calculated for the TML.	This section is disabled at the TML level. The check boxes correspond to the following fields on the Corrosion Analysis Settings datasheet: • **Least Squares** corresponds to Corrosion Rate Options - Least Square. • **Short Term** corresponds to Corrosion Rate Options - Short Term. • **Long Term** corresponds to Corrosion Rate Options - Long Term. By default, the **Short Term** and **Long Term** check boxes are selected. If custom corrosion rates are enabled, additional check boxes will be visible that correspond to those corrosion rates. Custom corrosion rates are only available in the on-premises version of GE Digital APM. Additionally, the check boxes determine the data that will be plotted on the TML Trends Graph.
Corrosion Rate Variance	Numeric	Specifies a value for the amount of variation that is allowed between the Short Term Corrosion Rate in the related TML Corrosion Analysis, and the Minimum Corrosion Rate.	This field is used to validate measurement data. The value in this field is only considered if it is greater than 0.
Default Inspection Interval	Numeric	Specifies in months the default interval for inspections for the TML.	This field is used to populate the Interval Next Inspection Date field in the related TML Corrosion Analysis.

Field	Data Type	Description	Behavior and Usage
Default T-Min	Numeric	Specifies the default minimum thickness value for calculations in the related corrosion analysis.	This field is disabled at the TML level. If the related TML Corrosion Analysis has no value in the Minimum Thickness field, the value in this field is used instead. By default, this field is 0.
Inspection Interval Options	Boolean	When selected, indicate that Remaining Life Factor and Default Inspection Interval should be used to determine the Factor Remaining Life Date and Interval Next Inspection Date, respectively. Additionally, this determines how Scheduled Next Inspection Date will be calculated for the related corrosion analysis.	This field is disabled at the TML level. The check boxes correspond to the following fields on the Corrosion Analysis Settings datasheet: • **Factor Remaining Life** corresponds to Inspection Interval Options - Factor Remaining Life. • **Inspection Interval** corresponds to Inspection Interval Options - Inspection Interval. When the **Factor Remaining Life** check box is selected, the Remaining Life Factor field is used to calculate the Factor Remaining Life Date field in the related TML Corrosion Analysis. When the **Inspection Interval** check box is selected, the Default Inspection Interval field is used to calculate the Interval Next Inspection Date field.
Minimum Corrosion Rate	Numeric	Specifies the default minimum corrosion rate value for calculations in the related corrosion analysis.	If a corrosion rate cannot be determined in the related corrosion analysis, the value in this field is used instead.

Field	Data Type	Description	Behavior and Usage
Minimum Number of TMLs	Numeric	Specifies the minimum number of TMLs that must be used to calculate the Average Corrosion Rate when the Percentile field is less than 100.	This field is only considered if the Controlling Corrosion Rate is set to Average. When the value in the Percentile field excludes TMLs from being used to calculate the Average Corrosion Rate, the value in this field ensures a minimum number of TMLs are still used to make the calculation. For example, assume the Minimum Number of TMLs field was set to 20. If the value in the Percentile field determined that only the 10 TMLs with the highest rate of corrosion linked to an asset should be used to calculate Average Corrosion Rate, the value in the Minimum Number of TMLs field would take precedence, and the 20 TMLs highest rate of corrosion would be used instead. By default, the value in this field is 1.

Field	Data Type	Description	Behavior and Usage
Percentile	Numeric	Specifies what percentage of TMLs linked to an asset should be used to calculate Average Corrosion Rate.	This field is only considered if the Controlling Corrosion Rate is set to Average. This field determines the percentage of TMLs linked to an asset or TML Group that will be used to calculate the Average Corrosion Rate for the related Asset Corrosion Analysis. The TMLs used will always be those with the most conservative (i.e., highest) corrosion rates. For example, if you have an asset with 50 linked TMLs, and the Percentile field is set to 20, the 10 TMLs with the highest rate of corrosion will be used to calculate the Average Corrosion Rate for the asset. By default, value in this field is 100, which means all TMLs linked to an asset are used to calculate the Average Corrosion Rate.
Remaining Life Critical Number of TMLs	Numeric	Specifies the number of TMLs that will be used when calculating the remaining life for an asset.	When the value in this field is 1, the most conservative (i.e., lowest) remaining life value from all TML Analyses linked to the asset will be used to populate the Asset Calculated Remaining Life field in the related Asset Corrosion Analysis. When the value in this field is greater than 1, the Remaining Life values from the corresponding number of TMLs will be averaged, and the Asset Calculated Remaining Life field will be populated with the result. By default, the value in this field is 1.

Field	Data Type	Description	Behavior and Usage
Remaining Life Factor	Numeric	Specifies a value that is used to multiply the Remaining Life in the related TML Corrosion Analysis.	This field is disabled at the TML level. The value in this field must be greater than 0 and less than or equal to 1. It is only used to multiply the value in the Remaining Life field in the related TML Corrosion Analysis if the **Factor Remaining Life** check box is selected.
Safety Factor	Numeric	Specifies a value that is used to multiply the calculated average in order to determine the Average Corrosion Rate.	This field is only considered if the Controlling Corrosion Rate is set to Average. The value in this field is used as a multiplier for the Average Corrosion Rate in an Asset Corrosion Analysis, which determines the displayed value in the Average Corrosion Rate field. By default, the value in this field is 1, which means the actual Average Corrosion Rate will be used.

Field	Data Type	Description	Behavior and Usage
Std Deviation Factor	Numeric	Specifies a value that is used to determine outliers when calculating Statistical Corrosion Rate.	This field is only considered if the Controlling Corrosion Rate is set to Formula. The value in this field is used as a multiplier for TML CR SD when calculating the Statistical Corrosion Rate in the related Asset Corrosion Analysis. By default, the value in this field is 2.
Use Minimum Corrosion Rate	Boolean	When selected, indicates that when the calculated corrosion rate for a TML is less than the Minimum Corrosion Rate, the Minimum Corrosion Rate will be used for calculations instead.	This field is disabled at the TML level. When the check box is selected, the value in the Minimum Corrosion Rate field will be used for calculations in place of the value in the Corrosion Rate field in the related TML, if that value is less than the Minimum Corrosion Rate. **Note:** If the **Use Minimum Corrosion Rate** check box is cleared and only one Thickness Measurement is linked to a TML, the Minimum Corrosion Rate will be used.

Thickness Monitoring Tasks

The following table lists the Thickness Monitoring Task fields that are populated automatically when a Thickness Monitoring Task record is created. The following table provides an alphabetical list of the fields visible on the Thickness Monitoring Task datasheet.

Field	Data Type	Description	Behavior and Usage
Asset ID	Character	Specifies a unique ID for the asset.	The Record ID of the Equipment or TML Group record to which the Thickness Monitoring Task record is linked.
Coverage	Numeric	Specifies the percentage of the asset to be inspected.	By default, this field is set to 0.
Desired Interval	Numeric	Specifies the desired time between inspections.	By default, this field is set to 0.

Field	Data Type	Description	Behavior and Usage
Equipment Technical Number	Character	Specifies a unique ID for the asset that is recognized by operations and inspection personnel.	The value in this field is typically from a piping and instrumentation diagram.
Last Date	Date	Specifies the date on which the asset was last inspected.	This field is populated with the date the asset or TML Group was last inspected.
Max Date	Date	Specifies the date on which the maximum interval will be reached.	This field is populated with the date in the Calculated Date field in the linked Asset Corrosion Analysis.
Max Interval	Numeric	Specifies the maximum time between inspection events.	By default, this field is set to 0.
Min Date	Numeric	Specifies the date on which the asset may become eligible for inspection.	This field is populated with the date in the Calculated Date field in the linked Asset Corrosion Analysis.
Min Interval	Numeric	Specifies the minimum time between inspection events.	By default, this field is set to 0.
Modifiable	Boolean	Indicates that you have allowed this record to be modified by others.	By default, this field is False.
Next Date	Date	Specifies the date on which the next inspection must be performed.	This field is populated with the date in the Asset Controlling Next Insp Date field in the linked Asset Corrosion Analysis.
Next Date Basis	Character	Specifies the driver of the next date.	Usually, the value for the driver in this field is a Code, a company policy, or based on Remaining Life calculations.
Reason	Text	Specifies why this work is being requested.	For example, a value in this field could be Defects found on asset.
Rejectable	Boolean	Indicates that this task can be rejected by the requested approver.	By default, this field is False.
Reoccurring	Boolean	Indicates that this is a repeating task.	By default, this field is False.
Task Description	Character	Specifies the work to be performed during the execution of the task.	For example a value in this field could be Insulation to be replaced.

Field	Data Type	Description	Behavior and Usage
Task ID	Character	Specifies a unique ID for the task.	This field is populated automatically when the Thickness Monitoring Task is created.
Task State	Character	Specifies the state of the task in the approval and execution process.	Usually, the states available in this field are created to support the workflow of the organization.
Task Type	Character	Specifies what inspection methodology should be used for this task.	For example, a value in this field could be Internal Inspection, or External Inspection.
Unconstrain Min/Max Dates	Boolean	Indicates that you will set the Max and Min Date fields manually.	By default, this field is False.

TML Groups, TMLs, and Measurements

The following tables provide a list of various fields that are defined for the TML Group, Thickness Measurement Location, and Thickness Measurement families in the baseline GE Digital APM database. Depending on how your system has been configured, additional fields may be available in the families, and some fields may not behave exactly as described in the table.

Note: Although the fields are listed in alphabetical order in the tables, they will appear in a different order in the application. This list is not comprehensive. Baseline fields that are not displayed in the application are omitted. Certain datasheets may be divided into sections.

This family is enabled for site filtering, which means that records in this family can be assigned to a specific site, and will then only be accessible to users who are assigned to the same site and have the appropriate license and family privileges. For more information, refer to the Sites section of the documentation.

TML Group

Field	Data Type	Description	Behavior and Usage
Comments	Text	Stores comments.	None
Corrosion Group	Character	Specifies a system level identifier.	The value in this field appears as text following the TML Group ID.
Description	Character	Specifies a short description of the TML Group.	None.
Drawing Number	Character	Specifies a unique ID for the Isometric Drawing, PFD or P&ID.	The value in this field helps the inspector identify where the TML Group is located on an asset.

Field	Data Type	Description	Behavior and Usage
Line Class	Character	Specifies a class (Class 1, Class 2, Class 3, or Injection Point) that is used to determine inspection intervals based on API 570.	This field is relevant only to Piping assets.
Material Grade	Character	Specifies a Material Grade for the TML Group.	The list of valid values for this field comes from the Materials of Construction family

Used for determining Allowable Stress. |
| Material Specification | Character | Specifies a Material Specification for the TML Group. | The list of valid values for this field comes from the Materials of Construction family

Used for determining Allowable Stress. |
| Material Type | Character | Specifies a Material Type for the TML Group. | The list of valid values for this field comes from the Materials of Construction family

Used for determining Allowable Stress. |
Operating Pressure	Number	Specifies an Operating Pressure for the TML Group.	The value in this field should be less than the Design Pressure of the component.
Operating Temperature	Number	Specifies an Operating Temperature for the TML Group.	The value in this field should be less than the Design Temperature of the component.
System Type	Character	Specifies a classification for a TML Group (i.e., Floor of a Tank).	None
TML Group ID	Character	Specifies a unique ID for the TML Group.	The value in this field is populated automatically when the TML Group is created.

Thickness Measurement Location

Thickness Measurement Location records contain various fields that store information to identify a TML. When you create a new TML, you will need to supply information in some of these fields. The values in other fields will be populated or calculated automatically based on other values in the TML and related values.

Field	Data Type	Description	Behavior and Usage
Access	Character	Specifies a special requirement (Man Lift, Ladder, or Scaffold) for how a location must be accessed.	A value should be selected in this field when the TML is created, but can be modified later.
Additional Thickness	Number	Specifies the thickness that is over that which is required to prevent loss of containment plus corrosion allowance.	None.
Allowable Stress	Number	Specifies a value that represents the maximum amount of pressure that can safely be withstood at a given TML.	This field is enabled only if the Override Allowable Stress check box is selected. Otherwise, this field is disabled and populated automatically.
Apex Angle	Number	The angle of any conical section of the asset.	The value in this field is used for conical T-Min calculations.
Code Year (Allowable Stress Lookup)	Character	Specifies the year in which the Design Code was defined or updated.	This field appears as a list retrieved from the Piping Stress, PV Stress or Tank Stress reference table based on the value in the Design Code field. The value in this field is used to populate the Allowable Stress field.
Code Year (T-Min Formula)	Character	Specifies the year in which the Design Code was defined or updated.	The Code Year (T-Min Formula) field is populated with a list of years that exist in Thickness Monitoring Rules Lookup records and correspond to the value in the Design Code field in the TML. The value in the Code Year (T-Min Formula) field is used for determining which formula will be used for calculating the T-Min and Maximum Allowable Working Pressure values.
Component Type	Character	Specifies the type of component being inspected.	The value in this field is used to populate the Allowable Stress field.

Field	Data Type	Description	Behavior and Usage
Corroded Area Columns	Number	Specifies the number of columns in the corroded area grid.	The number of cells in the corroded area grid, as determined by the number of rows and columns, determines how many measurement values will be recorded for the area.
Corroded Area Length	Number	Specifies a value that indicates the length of the corroded area in inches.	Together, the Corroded Area Length and the Corroded Area Width represent the overall size of the corroded area.
Corroded Area Rows	Number	Specifies the number of rows in the corroded area grid.	The number of cells in the corroded area grid, as determined by the number of rows and columns, determines how many measurement values will be recorded for the area.
Corroded Area Width	Number	Specifies a value that indicates the width of the corroded area in inches.	Together, the Corroded Area Length and the Corroded Area Width represent the overall size of the corroded area.
Corrosion Allowance	Number	Specifies the additional thickness built in by design to allow for a specific expected corrosion rate and usable life of the asset.	The value in this field is used to determine the remaining life of the asset.
Course Height	Number	Specifies the height of each shell course on an AST.	The value in this field allows the user to calculated the static head pressure for each shell course and thus the minimum allowable thickness needed.
Course Number	Number	Specifies the shell course on an AST being inspected or to which the TML is assigned.	For Tanks of the type Welded Shell, the value in this field is used to calculate the Allowable Stress field.

Field	Data Type	Description	Behavior and Usage
Design Code	Character	Specifies a design code associated with the TML that is used for calculating T-Min.	This field appears as a list that is populated by the DSCD System Code Table. The value in this field is used to filter the list of values that appear in the Code Year (Allowable Stress Lookup) field. It is also used to determine the equipment type of a given Thickness Measurement Location. The MI_ASSET_TYPE System Code Table contains references to System Codes in the DSCD System Code Table.
Design Factor	Number	Specifies a factor used to calculate T-Min.	This field is a consideration of the design metal temperature (based on ambient temperatures), the maximum design temperature, the design specific gravity, the corrosion allowance (if any), and the seismic factor. The value in this field must be between 0 and 1. It will be rounded to 2 decimal places. The value in this field is used as an input for the T-Min Calculator only when Design Code is set to B31.8.
Design Pressure	Number	Specifies the maximum pressure at the TML.	This value is taken from the original design documents for the piece of equipment.
Design Temperature	Number	Specifies the maximum temperature at the TML.	This value is taken from the original design documents for the piece of equipment.
Dish Radius	Number	None.	None.
Distance From the Bottom	Number	Specifies a value that indicates how far the TML is from the bottom of the tank.	This field applies only to TMLs that are linked to assets or TML Groups that represent Tanks.

Field	Data Type	Description	Behavior and Usage
Excluded From Analysis	Boolean	Indicates whether the TML will be excluded from the Corrosion Analysis.	This field is read-only in the Thickness Measurement Location and displays the value that is defined via the **Exclude TMLs** window. When this check box is selected, the TML will not be used when performing asset corrosion calculations, and the Scheduled Next Inspection Date, Projected T-Min Date, and Estimated Remaining Life for the TML will be set to null. In addition, the corrosion rates for the excluded TMLs will be calculated for the TML Corrosion Analysis, but will not be used to determine a corrosion rate for the Asset Corrosion Analysis. Only members of the MI Thickness Monitoring Inspector Security Group can exclude TMLs from an analysis.
Fill Height	Number	Specifies the normal operating liquid height in the AST.	The value in this field may be used to calculate T-Min.
Floor Plate has Detection?	Boolean	Indicates whether or not the AST has a means to detect a leak.	The value in this field may be used to extend the recommended inspection intervals.
Floor Plate has Reinforced Lining?	Boolean	Indicates whether or not the AST has a lined and/or reinforced floor.	The value in this field may allow the user to specify a lower T-Min.
Head Diameter	Number	Specifies the diameter of a circular or cylindrical Head.	The value in this field is used for calculating T-Min.
Inside Diameter	Number	Specifies the diameter of a circular or cylindrical asset, measured using the inside wall.	The value in this field is used for calculating T-Min.
Inside Radius	Number	Specifies the radius of a circular or cylindrical asset, measured to the inside wall.	The value in this field is used for calculating T-Min.

Field	Data Type	Description	Behavior and Usage
Inspection Sequence Number	Number	Specifies a value that indicates the order in which a given TML will be inspected with respect to the other TMLs linked to the same asset or TML Group.	This field is used only to facilitate TML-based inspection workflows, and is not used in any calculations.
Insulated Flag	Boolean	Indicates whether the asset or TML Group is insulated at the TML.	This check box should be selected if the equipment is insulated. This field is for reference only. It does not have any affect on calculations.
Is Corroded Area?	Boolean	Indicates whether the TML represents a corroded area rather than a specific, corroded location.	When this check box is selected, the values in the Corroded Area Columns and Corroded Area Rows fields will create a corroded area "grid" that you will use for recording measurement values. When this check box is selected, measurement values will represent the thickness of the entire area rather than the thickness of a specific location.
ISO Drawing Number	Character	Specifies a unique ID for the Isometric Drawing, PFD or P&ID.	This will help the inspector identify where a TML is located on an asset.
Joint Factor	Number	None.	None.
Knuckle Radius	Number	None.	None.
Location	Character	Specifies the location of the TML on the asset or component.	This field used to provide a description of the location on the asset or component. When creating a new TML, you should type a description that will help you and others locate this TML.
Material Grade	Character	Specifies the grade of material used for the TML.	This field appears as a list that is filtered based on the value in the Material Specification field as specified in the Piping Stress, PV Stress, or Tank Stress reference table. The value in this field is used to populate the Allowable Stress field.

Field	Data Type	Description	Behavior and Usage
Material Specification	Character	Specifies the industrial specification of the material used for the TML.	This field appears as a list that is filtered based on the value in the Design Code field as specified in the Piping Stress, PV Stress, or Tank Stress reference table. The value in this field is used to populate the Allowable Stress field.
Material Type	Character	Specifies the type of material used for the TML.	This field is used to provide a description of material used at the location on the asset or component.
Maximum Operating Fill Height	Number	Specifies the maximum fill height for the AST.	The value in this field is used for calculating T-Min on an AST.
Mechanical Allowance	Number	None.	None.
Minimum Tensile Strength	Number	None.	None.
Minimum Thickness	Number	Specifies the T-Min value for the TML, which is the minimum wall thickness allowed at the specific location. Typically, you will want to replace an asset or component before any of its TMLs reach the minimum thickness.	The value in this field can be entered manually, or it can be calculated on the T-Min Calculator workspace. If this field does not contain a value, a value of 0 will be used in any calculations that use the T-Min value.
Minimum Thickness Type	Character	Specifies how the T-Min value was obtained. This field is populated with one of the following values: • Calculated. • Nominal. • User Defined.	This field is populated automatically only after the Minimum Thickness field has been populated.
Minimum Yield Strength	Number	None.	None.
Nominal Thickness	Number	Specifies a value that is intended to represent the value of the first measurement recorded for a TML, if the base measurement is recorded from a design specification or other published standard.	The value in this field is populated automatically based on a specified Piping Nominal Diameter value. This value is used to create a Nominal Measurement for a piping asset.

Field	Data Type	Description	Behavior and Usage
Number of Readings	Number	Specifies the number of values that can be entered in the Readings field in Thickness Measurements that are linked to the TML.	This field accepts only whole number, values between 1 (one) and 26. The data entry grid that is available in the Readings field will have a number of rows based on the value in this field.
Outside Diameter	Number	Specifies the diameter of a circular or cylindrical asset, measured using the outside wall.	The value in this field is used for calculating T-Min. The value in this field is populated automatically based on a specified Piping Nominal Diameter value.
Outside Radius	Number	Specifies the diameter of a circular or cylindrical asset, measured to the outside wall.	The value in this field is used for calculating T-Min.
Override Allowable Stress	Boolean	Indicates that the Allowable Stress field has been modified manually.	When this check box is selected, the Allowable Stress field is enabled and a value can be entered manually.
Piping Formula	Character	Specifies the B31.3 piping formula.	The values in this list are populated from the PIPFMU System Code Table. This field controls which B31.3 formula is used for the T-Min calculator.

Field	Data Type	Description	Behavior and Usage
Piping Nominal Diameter - DN	Number	Specifies a Nominal Diameter for piping.	DN (Nominal Diameter) data is considered a dimensionless designator, meaning that it does not have an assigned unit of measure and is determined by ASME specifications. The value in this field is used to populate fields for Piping Nominal Diameter.
			When you select a value for either the Piping Nominal Diameter - NPS or the Piping Nominal Diameter - DN fields:
			• A list of possible values is generated for the Schedule field in the **Piping** section of the TML datasheet.
			• After a value is selected for the Schedule field, the Pipe Properties reference table populates the Nominal Thickness and the Outside Diameter fields in the **Design General** section of the TML datasheet.

Field	Data Type	Description	Behavior and Usage
Piping Nominal Diameter - NPS	Number	Specifies a Nominal Pipe Size for piping.	NPS (Nominal Pipe Size) considered a dimensionless designator, meaning that it does not have an assigned unit of measure and is determined by ASME specifications. The value in this field is used to populate fields for Piping Nominal Diameter. When you select a value for either the Piping Nominal Diameter - NPS or the Piping Nominal Diameter - DN fields: • A list of possible values is generated for the Schedule field in the **Piping** section of the TML datasheet. • After a value is selected for the Schedule field, the Pipe Properties reference table populates the Nominal Thickness and the Outside Diameter fields in the **Design General** section of the TML datasheet.
Plate Thickness	Number	Specifies the thickness of the plates used to construct an AST.	The value in this field is used for determining nominal thickness for an AST.
Renew Historical Sequence Number	Number	Specifies a value that indicates the number of times a given Thickness Measurement Location has been renewed.	This field is read-only and contains no value if the Thickness Measurement Location has never been renewed.
Schedule	Character	Specifies a piping schedule for the TML.	The value in this field, along with the value in either the Piping Nominal Diameter - ND or the Piping Nominal Diameter - NPS field, uses the Pipe Properties reference table to populate the Nominal Thickness and the Outside Diameter fields in the **Design General** section of the TML datasheet.
Shell Type	Character	Specifies the geometry of the Shell.	The value in this field is used for calculating T-Min.

Field	Data Type	Description	Behavior and Usage
Specific Gravity	Number	Specifies the molecular weight of the representative fluid in an AST.	The value in this field is used to calculate: • T-Min for an AST. • Allowable Stress for tanks of the type, Annular Ring .
Status Changed By	Character	Specifies the name of the GE Digital APM Security User who last changed the value in the Status Indicator field.	This field is always disabled. This field is populated automatically whenever the Status Indicator is changed. When a TML is created, this field is populated with the name of the Security User who created it.
Status Changed Date	Date	Specifies the date when the value in the Status Indicator field was last changed.	This field is always disabled. This field is populated automatically whenever the Status Indicator is changed. When a TML is created, this field is populated with the current date.

Field	Data Type	Description	Behavior and Usage
Status Indicator	Character	Specifies the status of the TML, either Active or Inactive.	This field contains a list of values from the MI STATUS INDICATOR System Code Table. In the baseline GE Digital APM database, the list contains the following values: • Active. • Inactive. When this value is modified, the Status Changed By and Status Changed Date will be updated automatically. When this field is set to Inactive, values will be deleted from the following fields in the linked TML Corrosion Analysis: • Remaining Life. • Projected T-min Date. • Factor Remaining Life Date. • Interval Next Inspection Date. • Scheduled Next Inspection Date. Additionally, an inactive TML will not be included in corrosion calculations for an Asset Corrosion Analysis.
Tank Diameter	Number	Specifies the diameter of a tank.	This value is only used for TMLs that are linked to assets or TML Groups that represent tanks or components of a tank. **Note:** If this field contains a value that is greater than 200, T-Min cannot be calculated for the TML.
Tank Type	Character	Specifies the method of construction for an AST.	The value in this field will be used to calculate T-Min and Allowable Stress.
Temperature Factor	Number	None.	None.

Field	Data Type	Description	Behavior and Usage
TML Analysis Type	Character	Specifies the type of analysis (UT, RT, or TML). The value used by the Asset Corrosion Analysis to determine how to group the analysis results. A value must be selected in this field when the Thickness Measurement Location is created.	This field is populated with a list of values that are stored in the Inspection Type field in the Corrosion Analysis Settings that are linked to the asset or TML Group to which the TML is linked. In the baseline database, these values are stored as System Codes in the System Code Table CITP (Corrosion Inspection Type). By default, this System Code Table contains three System Codes: UT, RT, and TML. • UT (ultrasonic thickness) and RT (radiographic thickness) are provided for customers who want to classify TMLs according to inspection type and then perform calculations on each set. • TML is provided for customers who prefer to analyze all TMLs together.
TML Asset ID	Character	Specifies the ID of the Equipment or TML Group record for which the TML is created.	This field is always disabled. This field is populated automatically after the TML is first saved based on the Component ID Field setting for the Equipment or TML Group family.
TML Comment	Character	Stores descriptive information that is not recorded in another field in the TML.	None.
TML ID	Character	Specifies a unique ID for the TML.	The value in this field must be entered when a TML is created, and must be unique.
Vessel Type	Character	Specifies the geometry of the vessel.	The value in this field determines what formula is used when calculating T-Min.

Thickness Measurement

Thickness Measurements contain various fields that store information to identify a specific thickness reading at a TML. When you create a new Thickness Measurement, you will need to supply information in some of these fields. The values in other fields will be populated automatically based upon other values in the Thickness Measurement.

Field	Data Type	Description	Behavior and Usage
Historical Sequence Number	Number	Specifies a value that identifies the renewal sequence of the Thickness Measurement.	For example, if a Thickness Measurement Location has three Active Thickness Measurements, when the Thickness Measurement Location is renewed for the first time, the Historical Sequence Number of those three Thickness Measurements will be set to 1. If the Thickness Measurement Location is renewed again, the Historical Sequence Number of any Thickness Measurements that are Active at the time of the renewal will be set to 2.
Instrument Probe	Number	Specifies a value that uniquely identifies the specific probe that was used to collect the measurement value. This field is populated only when a measurement is recorded using a handheld device.	None.
Measurement Comment	Character	Specifies additional information about the measurement.	This field is used to store descriptive information that is not recorded in another field in the Thickness Measurement.
Measurement ID	Character	Specifies the Record ID of the Thickness Measurement.	The value from the Record ID field is copied to the Measurement ID field when the Thickness Measurement is saved. Note that if you modify the ID Template of the Thickness Measurement family and update existing Record IDs, values in the Measurement ID field will not be updated in existing Thickness Measurements until those measurements are saved.

Field	Data Type	Description	Behavior and Usage
Measurement Imported by Data Loader	Boolean	Indicates whether the Thickness Measurement is loaded by the data loader.	This field is populated with the value True if the Thickness Measurement record is loaded by the data loader. If the value in this field is True, duplicate validations are removed when the record is loaded through data loader.
Measurement Status Changed By	Character	Specifies the first and last names of the GE Digital APM Security User who last changed the value in the Measurement Status Indicator field.	This value is updated whenever the value in the Measurement Status Indicator field is changed, either manually or automatically (e.g., when the root Thickness Measurement Location is renewed).
Measurement Status Indicator	Character	Specifies whether the Thickness Measurement is Active or Inactive.	Thickness Measurements that are flagged as Inactive are not used for performing TML Corrosion Analysis calculations.

Field	Data Type	Description	Behavior and Usage
Measurement Taken By	Character	Specifies the person who recorded the measurement value in the following format: <Last Name>, <First Name> ~ <User ID>	The list in this field contains the names of individual(s) who have been granted the TM Technician role. When you create a Thickness Measurement, if you have been granted the TM Technician role, the value is set by default to your name. You can change the value by selecting another name in the list. The default rule on the Measurement Taken By field specifies that the list is restricted, meaning that you cannot type your own value in the list. If the default rule has been modified to make the list unrestricted, you will be able to type a value in this field, and save it with the Thickness Measurement. The Human Resource records used to populate this field are filtered based on the user's applied sites. If the Human Resource record is not associated with a specific user, the record is included by default.
Measurement Taken Date	Date	Specifies the date that the measurement value was recorded.	This may be the date that the Thickness Measurement was created, or it may be a different date, particularly if the Thickness Measurement was created some time after the measurement was physically recorded.

Field	Data Type	Description	Behavior and Usage
Measurement Value	Number	Specifies the value, in inches, for a given thickness measurement.	The Measurement Value represents the thickness of the asset or component at the TML on the Measurement Taken Date. The Measurement Value can be a reading that was taken physically or that was recorded based on a design code or specification. This field is populated automatically with the value in the Uncorrected Measurement field.
Measurement Verified	Character	Specifies whether the Measurement Value has been manually verified.	This field is populated with a list of System Codes in the MI YES System Code Table. After the value in the Verify Measurement field has been set to Yes, this field should be set to Yes to indicate that the measurement data in question has been validated and corrected if needed.
Nominal	Boolean	Indicates whether the measurement was taken physically (the check box is not selected) or recorded from another source, such as a published design specification (the check box is selected).	All Nominal Thickness Measurements will be set automatically to Inactive after two subsequent Actual Thickness Measurements have been created. Thickness Measurements that are marked as Inactive will not be used for performing TML Corrosion Analysis calculations. This means that after two or more Actual Thickness Measurements exist, Nominal Thickness Measurements will no longer be used in calculations.

Field	Data Type	Description	Behavior and Usage
Readings	Character	Specifies values that represent the readings that were collected for a given thickness measurement.	The number of values that can be recorded in the Readings field corresponds to the value in the Number of Readings field in the Thickness Measurement Location to which the Thickness Measurement is linked. The Readings field provides access to an editable grid that contains one row per reading value that can be entered. After values have been entered in the Readings field in a given Thickness Measurement, the value in the Uncorrected Measurement field in that same measurement is calculated based on the Application Settings that have been defined for measurement readings.
Readings Pass/Fail	Character	Specifies a value that indicates whether the values in the Readings field passed or failed evaluation based on the Reading Tolerance setting.	This field is populated with a list of System Codes in the MI PASS FAIL ONLY System Code Table.
Status Changed Date	Date	Specifies the date that the value in the Status Indicator field was last changed.	This field is updated automatically whenever the value in the Status Indicator field changes.
Temperature	Number	Specifies the temperature at which the measurement value was recorded.	This is an optional field that, by default, stores the value entered by the user. This field is provided so that custom rules can be developed, if desired, to allow for a calculation that will adjust the measurement value based upon the temperature at which the reading was taken.

Field	Data Type	Description	Behavior and Usage
Uncorrected Measurement	Number	Specifies a value that is the result of the calculation that was performed against values in the Readings field.	The Uncorrected Measurement field is meant to serve as an intermediate storage location between the Readings and Measurement Value fields. If needed, you can create custom rules for the Measurement Value field so that the Uncorrected Measurement value is adjusted based on additional factors and the result of that calculation becomes the value in the Measurement Value field.
Verify Measurement	Character	Specifies a value that indicates whether the value in the Measurement Value field requires manual verification based on the Allowable Measurement Variance and/or Corrosion Rate Variance validation.	This field is populated with a list of System Codes in the MI YES NO System Code Table.

Corrosion Rates in Thickness Monitoring

About Corrosion Rates

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

About Custom Corrosion Rates

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

Long Term Corrosion Rate (LTCR)

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Short Term Corrosion Rate (STCR)

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Least Squares Corrosion Rate (LSCR)

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Maximum Historical Corrosion Rate (MHCR)

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Calculations

Overview of TM Calculations

A Corrosion Analysis includes one or more assets and all the TM-specific records that are linked to them. As you conduct a Corrosion Analysis, various calculations and validations are performed, and the results are stored in various records involved in the Corrosion Analysis.

In this section of the documentation, we provide descriptions of the calculations and validations that are performed within a Corrosion Analysis. These descriptions are classified according to the type of record for which the calculation or validation is performed:

- **Asset Corrosion Analysis:** Stores summary information and calculations that are performed using the information in the related Thickness Measurement Location and Thickness Measurement records.
- **TML Corrosion Analysis:** Stores summary information and calculations performed using the information in related Thickness Measurement Location and Thickness Measurement records.
- **Thickness Measurement:** Stores measurement data and performs calculations. The values calculated in Thickness Measurement records are used for calculating values in the associated TML Corrosion Analysis record.

Thickness Monitoring uses specific formulas, equations, and estimation methods to arrive at the values that are stored in these records. In order to understand the information that is displayed to you for a given analysis, you must understand how the values were determined.

Measurement Calculations

This topic has been intentionally excluded from the GE Digital APM product documentation website. This topic is available to you via the product documentation that is provided within the GE Digital APM system.

Datasheet Calculations

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About Interpolation

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About the Calculated T-Min Formulas

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Reference Tables that are Used to Calculate Allowable Stress

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Maximum Allowable Working Pressure (MAWP) Calculation

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About Fields Required for Calculated T-Min

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Interpret the Calculation Details

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Piping Nominal T-Min Reference Table

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Piping Nominal Diameter

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Tank T-Min Annular Ring Reference Table

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Reading Tolerance

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Family Search Configuration

Family Search Configuration

The following families for Thickness Monitoring are included in the Global Search:

- Analysis
- Asset Corrosion Analysis
- Corrosion
- Datapoint
- Materials of Construction
- Pipe Properties

- Piping Nominal T-Min
- Piping Stress
- PV Nominal T-Min
- PV Stress
- Tank Nominal T-Min
- Tank Stress
- Tank T-Min Annular Ring
- Thickness Monitoring Task
- Thickness Measurement Location
- TML Group

By default, the search results for all the other families for Thickness Monitoring are excluded from Global Search.

Note: You can configure a family to be included or excluded from the Global Search using the Search Configuration.