

*Ansys GRANTA MI 2021 R1*

# **GRANTA MI Excel Exporter Reference Guide**

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## Contents

<b>1</b>	<b><i>Introduction.....</i></b>	<b>5</b>
1.1	Features of the Excel Exporter .....	5
1.2	Limitations .....	5
1.3	Creating Excel templates .....	6
1.4	MI:Toolbox documentation.....	6
<b>2</b>	<b><i>Template overview.....</i></b>	<b>7</b>
<b>3</b>	<b><i>Export Lookup worksheet.....</i></b>	<b>8</b>
3.1	Attribute Name.....	9
3.2	Parent Attribute .....	10
3.3	Data Type .....	10
3.4	Units .....	11
3.5	Worksheet .....	12
3.6	Specimen .....	12
3.7	Data Range .....	13
3.8	Quality Range .....	13
3.9	Parameter n Range .....	13
3.10	Parameter n Default Value .....	14
3.11	Line Type.....	14
3.12	Parameter n Name .....	14
<b>4</b>	<b><i>Parameter Lookup worksheet.....</i></b>	<b>16</b>
4.1	Parameter .....	17
4.2	Data Range .....	17
4.3	Units .....	17
<b>5</b>	<b><i>Data worksheets .....</i></b>	<b>18</b>
5.1	Named Ranges.....	18
5.2	File data .....	20
5.3	Float functional data .....	21

5.4	Discrete functional series data .....	23
5.5	Hyperlink data .....	23
5.6	Equations and Logic data.....	24
5.7	Tabular data.....	26
5.8	Multi-value data .....	28
5.9	Quality ratings .....	29
5.10	Record properties.....	29
5.11	Subset membership.....	31
<b>6</b>	<b><i>Import Options worksheet .....</i></b>	<b><i>32</i></b>
6.1	Valid tables .....	32
6.2	Exported worksheet naming conventions.....	32
6.3	Naming conventions for exported files and folders.....	35
<b>7</b>	<b><i>Exporting multiple records.....</i></b>	<b><i>36</i></b>
7.1	Row data.....	37
7.2	Column data .....	37
7.3	Worksheet data .....	38
<b>8</b>	<b><i>Exporting trailing zeroes .....</i></b>	<b><i>39</i></b>
<b>9</b>	<b><i>Using the MI:Toolbox Excel Exporter plug-in .....</i></b>	<b><i>40</i></b>
<b>10</b>	<b><i>Location of Excel Exporter templates.....</i></b>	<b><i>42</i></b>
10.1	Automatically-generated templates .....	42
10.2	Custom templates .....	42
	<b><i>Appendix A. Example Excel template worksheets.....</i></b>	<b><i>43</i></b>
A.1	Sample 'Export Lookup' worksheet.....	43
A.2	Sample 'Parameter Lookup' worksheet .....	43
A.3	Sample 'Data' worksheet .....	44

# 1 Introduction

Data can be exported from a GRANTA MI database to Microsoft® Excel® format, for example, for analysis, or to allow the data to be quickly cleansed and edited, before being reimporting to the database.

The Excel Exporter uses Excel ‘templates’ to identify which attributes will be exported, how attributes of different types are to be handled, and how the data in the output Excel worksheet should be formatted. Excel templates can be used both to export data from a GRANTA MI database and also to import new or updated data to the database.

This document describes the specification of the Excel templates for exporting data from GRANTA MI.

## 1.1 Features of the Excel Exporter

- Exports data from a GRANTA MI database into a correctly formatted Microsoft Excel workbook. \*.xls, \*.xlsx and \*.xlsm formats are supported.
- All data types except discrete functional gridded data can be exported.
- Record properties can be exported, including Record Name, Short (tree) Name, Last Modified Date, Last Modified By, Created Date, Created By, Record GUID, Record Color, Record Type, Version number, and Version state.
- Trailing zeroes can be exported for point data, range data, and point and range columns in tabular data.
- Multiple records can be exported at once. These can be exported into multiple workbooks, into individual worksheets within a workbook, or as individual rows or columns within a worksheet.
- Unit conversion is carried out during the export using unit conversion information in the database.
- Exported data can be imported back into a GRANTA MI database with no additional formatting. The links back to the original data can be maintained.
- Third-party macros can be used to perform calculations on the exported data, with results imported back into the database.

## 1.2 Limitations

Excel import/export functionality in GRANTA MI is based on [SpreadsheetGear](#), a 3<sup>rd</sup> party library for writing/reading .XLS and .XSLX files. There are some limitations on what can be read from and

written to spreadsheet files by SpreadSheetGear, and these limitations also apply when using the GRANTA MI Excel Importer/Exporter:

- Cell comments and form controls (such as buttons, checkboxes, list boxes, etc...) will not be read from .xlsx or .xlsm files.
- Excel Tables are not supported. Table references in formulas such as [Sales] are converted to #REF!

For a full list of supported Excel compatible functions, see

<https://www.spreadsheetsgear.com/products/spreadsheetsgear.net.aspx#FunctionList>

### 1.3 Creating Excel templates

Excel templates for exporting and importing data can be created in a number of different ways:

- **In the MI:Toolbox Excel Exporter plug-in.** ‘Automatically-generated templates’ can be created, based on a set of selected records. You can specify which attributes are to be exported, how attributes of different types are to be handled, and how the Microsoft Excel output worksheet should be formatted. By default, automatically generated templates are saved locally, and can subsequently be edited, as required, in Microsoft Excel.
- **In MI:Viewer.** Any MI:Viewer user can download an Excel template for importing (or exporting) data to/from a selected table or folder, using the attribute information, formatting, and other options specified in a preconfigured Excel Template Definition (set up by the MI administrator in MI:Admin). Templates generated in this way can subsequently be edited, as required, in Microsoft Excel.
- **In Microsoft Excel.** Template workbooks can be defined manually in Microsoft Excel by creating correctly-formatted worksheets specifying the required data entry, lookup, and import options. This is a specialist task, requiring familiarity both with Microsoft Excel and with the structure of the database from which the data is exported/into which the data will be imported.

### 1.4 MI:Toolbox documentation

Reference documentation for the MI:Toolbox exporters and importers, including this document, can be found in any of the following locations:

- On your MI:Toolbox host, in the Excel Exporter plugin installation folder, typically:  
C:\Program Files\Granta\GRANTA MI\Toolbox\plugins\Exporters\Excel\Documentation
- In MI:Viewer: click on **Help > Reference Documentation**.
- In the *Documentation library* on the [GRANTA MI Support](#) site (sign-in is required).

## 2 Template overview

An Excel template typically includes one or more Data worksheets, and a number of ‘metadata’ worksheets that specify the attribute and parameter lookup information, and other options used when exporting and/or importing data.

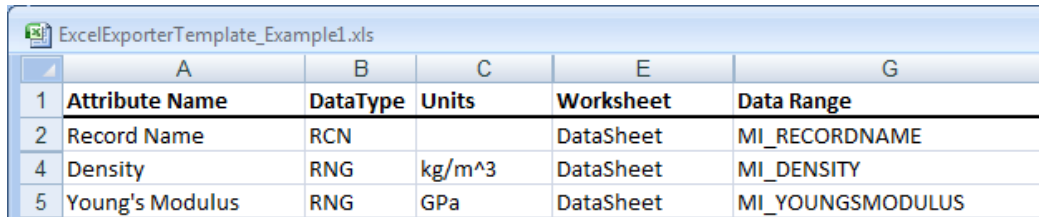
Worksheet name	Contents	See
Data	Data to be exported.	5, Data worksheets
Export Lookup	This worksheet is always required and specifies information about the attributes to be exported, including the attribute name, data type, and unit.	3, Export Lookup worksheet
Parameter Lookup	This worksheet is required for functional, tabular, and multi-value point data, and contains information on the parameter data.	4, Parameter Lookup worksheet
Import Options	This worksheet specifies the table to which the template applies, the naming scheme for multiple data worksheets and any files created by the export, and sets a number of options used when re-importing the exported data back into the MI database.	6, Import Options worksheet

The lookup and options worksheets can be hidden to prevent unwanted changes by users. The data worksheets should not be hidden.

Example worksheets are shown in [Appendix A](#).

### 3 Export Lookup worksheet

The Export Lookup worksheet contains a list of all the GRANTA MI attributes to be exported, their data type and units, and the location for the data in the Excel workbook. Each row represents an attribute, record property, or subset, for example:



	A	B	C	E	G
1	<b>Attribute Name</b>	<b>DataType</b>	<b>Units</b>	<b>Worksheet</b>	<b>Data Range</b>
2	Record Name	RCN		DataSheet	MI_RECORDNAME
4	Density	RNG	kg/m <sup>3</sup>	DataSheet	MI_DENSITY
5	Young's Modulus	RNG	GPa	DataSheet	MI_YOUNGSMODULUS

Each attribute on this worksheet is processed until a blank row is reached. Errors will be reported if the data is incorrectly formatted, or if a specified worksheet or named range is not valid in the current workbook.

The first row of the Export Lookup worksheet must contain the column titles as listed below, spelt correctly. 'Attribute Name' must be the title of the first column. The remaining columns may be in any order.

Table 1. Required and optional columns on the Export Lookup worksheet

Column	Required or Optional...	...for these Data Types
<a href="#">Attribute Name</a>	Required	All
<a href="#">DataType</a>	Required	All
<a href="#">Units</a>	Required	Numeric data
<a href="#">Worksheet</a>	Required	All
<a href="#">Data Range</a>	Required	All
<a href="#">Specimen</a>	Optional	All
<a href="#">Quality Range</a>	Optional	All
<a href="#">Parameter n Range</a>	Required	Functional data, tabular data, some equations and logic data, and some multi-value point data
<a href="#">Parameter n Default Value</a>	Optional	Functional data



Column	Required or Optional...	...for these Data Types
<a href="#">Line Type</a>	Optional	Functional data
<a href="#">Parameter n Name</a>	Optional	Functional data
<a href="#">Parent Attribute</a>	Required	Metadata

**Note:** Automatically-generated templates may contain more columns in the *Export Lookup* worksheet than listed above; these columns are not used at present.

### 3.1 Attribute Name

This column specifies the name of the attribute in the GRANTA MI database that the data is to be exported from. This must exactly match the attribute name in the database.

Record Name must be the first row, and specifies where the name of the new record will go in the worksheet. A row for the Record Short Name is optional. The Short Name is also referred to as the Tree Name.

	A	B	C	D	E	F	G
1	Attribute Name	DataType	Units	Parent Attribute	Worksheet	Specimen	Data Range
2	Record Name	RCN			DataSheet	ROW	MI_RECORDNAME
3	Record Short Name	RCSN			DataSheet	ROW	MI_SHORTNAME

The Attribute Name column can also include items that are not attributes, such as subset membership and record color.

### 3.2 Parent Attribute

This column is used for meta-attributes only, and identifies a meta-attribute's parent attribute. For example, in the worksheet shown below, you can see an entry for the *Young's Modulus* attribute meta attribute *Standard Deviation*:

	A	B	C	D	E	G
1	<b>Attribute Name</b>	<b>DataType</b>	<b>Units</b>	<b>Parent Attribute</b>	<b>Worksheet</b>	<b>Data Range</b>
2	Record Name	RCN			DataSheet	MI_RECORDNAME
3	Record Short Name	RCSN			DataSheet	MI_SHORTNAME
4	Density	RNG	kg/m <sup>3</sup>		DataSheet	MI_DENSITY
5	Young's Modulus	RNG	GPa		DataSheet	MI_YOUNGSMODULUS
6	Standard Deviation	PNT		Young's Modulus	DataSheet	MI_YM_SD

The meta-attribute and attribute named must exist in the database.

### 3.3 DataType

This column specifies the data type of the attribute or data to be exported using a three or four letter code. The data type must match the data type of the attribute in the database.

Table 2. *DataType* codes for exporting from a GRANTA MI database

<b>DataType code</b>	<b>GRANTA MI data type</b>	<b>Comment</b>
DAT	Date	
DCT	Discrete	Includes multi-value discrete
FDA	Float Functional	Series (graph)
FDD	Discrete Functional	Series data only; gridded data will not be exported
FIL or FILE	File	See 6.3 for naming conventions for exported files
GFA	Float Functional	Gridded (graph)
HYP	Hyperlink	
INT	Integer	
LOG	Logical	
LTXT	Long Text	
MAFN	Equations and Logic	

DataType code	GRANTA MI data type	Comment
PIC	Picture	See 6.3 for naming conventions for exported pictures
PNT	Point	Includes multi-value point
RCLR	Record Color	See 5.10 for color data values.
RCN	Record Name	
RCSN	Record Short Name	
RNG	Range	
STXT	Short Text	
SUBSET	Subset	See 5.11
TABL	Tabular	

**Notes:**

- For meta attributes, the DataType refers to the meta-attribute rather than the parent attribute. A meta-attribute may have a different data type to that of its parent.
- See Section 5.4 for information on the different formats of functional data.

### 3.4 Units

This column specifies the units of the data. This must match the unit symbol of the attribute in the GRANTA MI database that the data is to be exported from. Alternatively, the units in the template must be convertible into the attribute's units using conversion information in the database.

For discrete attributes, you do not need to specify the name of the discrete type.

For meta attributes, the Units column refers to the meta attribute rather than the parent attribute. A meta attribute may have a different unit to that of its parent, but it must still match the units of the meta attribute in the database.

In the database, trailing zero information can be stored for point data, range data, and point and range columns in tabular data. For the trailing zeroes to be preserved during the export, the unit for the attribute in the *Export Lookup* worksheet must be the same as the unit in which the value was originally entered (see Section 7.2 for more information on handling trailing zeroes).

#### Currency data

Currency is a unit, and should be treated as a unit, although it may be considered a 'special' unit. To export data using the currency for the database, use 'currency' in the Units column (excluding quotes). To export data in a chosen currency, use the three letter ISO 4217 currency code in the Units column. The exchange rate from the configuration database is used to convert the database value into the value for export. The currency unit can be used in combination with other units.

For example, suppose the currency for a database is US Dollars (USD). (The database currency is set as a property of the database in the MI:Admin Schema tool.)

- If you use units of 'currency', the exported value will be in US Dollars:

	A	B	C
1	<b>Attribute Name</b>	<b>DataType</b>	<b>Units</b>
2	Record Name	RCN	
3	Short Name	RCSN	
6	Young's modulus	RNG	GPa
8	Density	RNG	Mg/m <sup>3</sup>
9	Price	RNG	currency/kg
10	Capital cost	RNG	currency

- If you use units of 'AUD', the exported value will be in Australian Dollars. If you use units of 'USD', the exported value will be in US Dollars:

	A	B	C
1	<b>Attribute Name</b>	<b>DataType</b>	<b>Units</b>
2	Record Name	RCN	
3	Short Name	RCSN	
6	Young's modulus	RNG	GPa
8	Density	RNG	Mg/m <sup>3</sup>
9	Price	RNG	AUD/kg
10	Capital cost	RNG	USD

### 3.5 Worksheet

This column specifies the name or index of the worksheet where the data for the attribute will be located. When an index is used, enter the numeric value into the Worksheet column. For example, if you want the data to be written to the first worksheet, enter '1' in the Worksheet column. When using one of the naming schemes (see Section 6.2), it is recommended that a Worksheet name is 10 characters or less.

### 3.6 Specimen

This column specifies how multiple records will be exported. The valid options are:

- **Row** allows records to be exported to a single row within the worksheet.
- **Column** allows records to be exported to a single column within the worksheet.
- **Worksheet** allows exported records to be written to individual worksheets.
- No value specified: each record is exported to a separate workbook.

See also Section 7.1, Exporting multiple records.

### 3.7 Data Range

This column specifies the named range in the worksheet where the attribute data will be stored.

### 3.8 Quality Range

This column specifies the named range in the worksheet where the quality rating for the data is stored.

Quality ratings **can** be exported for the following types of data: point, integer, range, short text, long text, logical, date, discrete (including multi-value discrete), hyperlink, equations and logic, numeric functional series and gridded.

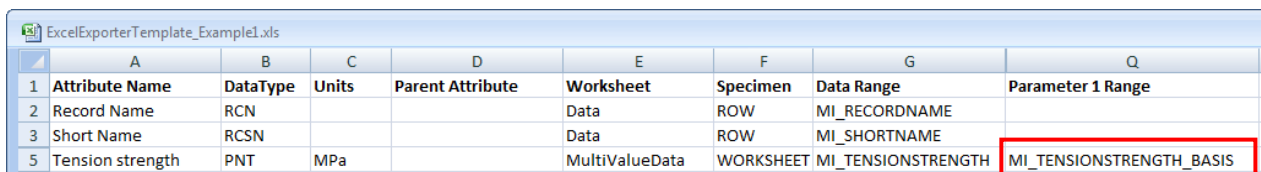
Quality ratings **cannot** be exported for picture, file, tabular, or multi-value point data.

### 3.9 Parameter *n* Range

where *n* is an integer, from 1 to 30, e.g. *Parameter 1 Range*, *Parameter 2 Range* etc.

For functional data, equations and logic data, and multi-value point data, this column specifies the name of the range in the worksheet where the parameter values are to be stored. 'Parameter 1 Range' is assumed to be the default X-axis when displaying the data as a graph.

Functional data example:



	A	B	C	D	E	F	G	Q
1	Attribute Name	DataType	Units	Parent Attribute	Worksheet	Specimen	Data Range	Parameter 1 Range
2	Record Name	RCN			Data	ROW	MI_RECORDNAME	
3	Short Name	RCSN			Data	ROW	MI_SHORTNAME	
5	Tension strength	PNT	MPa		MultiValueData	WORKSHEET	MI_TENSIONSTRENGTH	MI_TENSIONSTRENGTH_BASIS

If multiple series are to be exported for an attribute, the stem of the named ranges should be entered into this column; see Section 5.4 for more information.

For tabular data, this column specifies the name of the range in the worksheet where the data values for the tabular column are to be exported. One parameter range is used for each column.

### 3.10 Parameter $n$ Default Value

where  $n$  is an integer, from 1 to 30, e.g. Parameter 1 Default Value, Parameter 2 Default Value etc.

This column specifies the name of the range in the worksheet where the default parameter value value is stored.

- The named range (which is just a single cell) should exist in the *Functional Data* worksheet.
- The expected suffix for the named range is `_DEFAULT`.
- The stem of the named range is the parameter's named range. For example, if the named range for the Parameter 1 Range is `MI_TEMPERATURE`, the named range for the Parameter 1 Default Value should be set to `MI_TEMPERATURE_DEFAULT`.

1	Attribute Name	DataType	Units	Worksheet	Specimen	Data Range	Parameter 1 Range	Parameter 1 Default Value
2	Record Name	RCN		DataSheet	ROW	MI_RECORDNAME		
3	Record Short Name	RCSN		DataSheet	ROW	MI_SHORTNAME		
7	Series Daily Sunshine	FDA	hr	Functional Data	WORKSHEET	MI_SERIESDAILYSUNSHINE	MI_SERIESDAILYSUNSHINE_TIME	MI_SERIESDAILYSUNSHINE_TIME_DEFAULT

Note that Parameter Default Value columns are not included in output from the standard exporters.

### 3.11 Line Type

For use with float functional data, this column shows how the functional graph is displayed in GRANTA MI. It contains the name of the range in the worksheet where the option is stored. For each series, the valid options are:

- lines
- markers
- both

If multiple series are to be exported for an attribute, the stem of the named ranges should be entered into the Line Type column. See Section 5.4 for more information.

### 3.12 Parameter $n$ Name

where  $n$  is an integer, from 2 to 10 e.g. Parameter 2 Name, Parameter 3 Name etc.

For use with functional data, this column contains the name of the range in the worksheet where the name for specific parameter values is to be stored. For example, a tensile test carried out at temperature of 23°C can be given the name 'Room Temperature':

- 'Parameter 2' is Temperature.
- 'Parameter 2 Range' contains the named range that refers to the cell where the value of 23 will be stored,

- 'Parameter 2 Name' contains the named range that refers to the cell where the value of 'Room Temperature' will be stored.

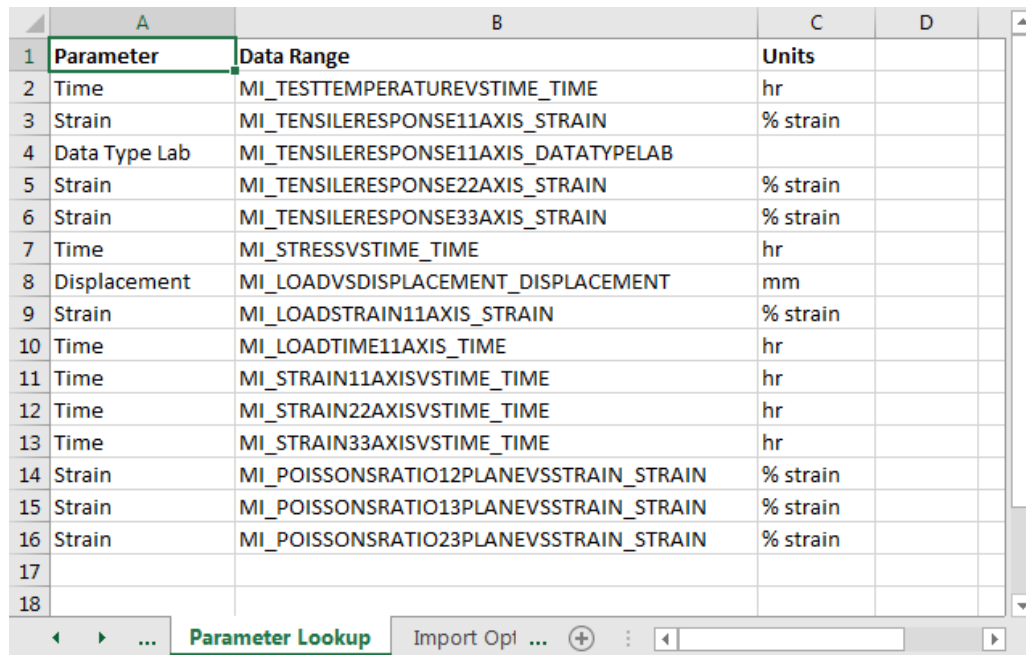
The Parameter Name can be thought of as a label for that parameter value in that series, and only applies to the functional data for that attribute in the template. It does not need to correspond to a named parameter value in the database.

If multiple series are to be exported for an attribute, the stem of the named ranges should be entered into the Parameter Range column. See Section [5.4](#) for more information.

## 4 Parameter Lookup worksheet

The Parameter Lookup worksheet contains a list of all the parameter and tabular column ranges in the Export Lookup worksheet and how they are mapped onto the GRANTA MI database parameters or tabular columns. This worksheet is only required for functional data, tabular data and multi-value point data. Each row represents the parameter range or tabular column for an attribute.

Functional data with multiple series also only requires one row per parameter range for an attribute; see Section 5.4 for more information.



Parameter	Data Range	Units
Time	MI_TESTTEMPERATUREVSTIME_TIME	hr
Strain	MI_TENSILERESPONSE11AXIS_STRAIN	% strain
Data Type Lab	MI_TENSILERESPONSE11AXIS_DATATYPELAB	
Strain	MI_TENSILERESPONSE22AXIS_STRAIN	% strain
Strain	MI_TENSILERESPONSE33AXIS_STRAIN	% strain
Time	MI_STRESSVSTIME_TIME	hr
Displacement	MI_LOADVSDISPLACEMENT_DISPLACEMENT	mm
Strain	MI_LOADSTRAIN11AXIS_STRAIN	% strain
Time	MI_LOADTIME11AXIS_TIME	hr
Time	MI_STRAIN11AXISVSTIME_TIME	hr
Time	MI_STRAIN22AXISVSTIME_TIME	hr
Time	MI_STRAIN33AXISVSTIME_TIME	hr
Strain	MI_POISSONSRATIO12PLANEVSSTRAIN_STRAIN	% strain
Strain	MI_POISSONSRATIO13PLANEVSSTRAIN_STRAIN	% strain
Strain	MI_POISSONSRATIO23PLANEVSSTRAIN_STRAIN	% strain

Figure 1. Sample 'Parameter Lookup' worksheet

The order of these columns must be as follows (see also the sample shown above), but the column titles in the template need not match with those listed. All columns are required.

1. Parameter
2. Data Range
3. Units

For templates used to export **and** import data, the same *Parameter Lookup* worksheet is used to list the parameter ranges in both the *Export Lookup* worksheet (for exporting data) and *Attribute Lookup* worksheet (for importing data).



## 4.1 Parameter

This column contains the name of the parameter in the GRANTA MI database that the data is to be exported from. The parameter name in the template must match the parameter name in the database exactly. As each row represents the parameter range for an attribute, it is possible for the same parameter name to be repeated in the column, each instance for a different attribute. For example, in *Figure 8* you can see the attributes *Test Temperature vs Time* (Row 2) and *Stress vs Time* (Row 7).

When used for tabular data, this column contains the name of the tabular column that the data is to be exported from. For a **Local Data** column, the column name in the template must match the column name in the database exactly. For the **Linked Records** column, the name in this column must be **MI LINKED VALUE**.

## 4.2 Data Range

This column contains each unique **Parameter Range** from the *Export Lookup* worksheet, that is, the named range in the worksheet where the parameter/tabular column data is to be stored.

If the **Data Range** for a **Parameter Range** is not found, then the data for the parameter is not exported.

When used for tabular data, the name in this column is the same as **Parameter Range** on the *Export Lookup* worksheet.

## 4.3 Units

This column contains the units of the parameter/tabular column data. The units in the template must match the unit symbol of the parameter/tabular column in the GRANTA MI database that the data is to be exported from. Alternatively, the units in the template must be convertible into the parameter/tabular units using conversion information in the database.

For discrete parameters, you do not need to set a Unit.

The currency unit can be used for numeric parameters. For more information on using the currency units, see Section [4.3, Units](#).

## 5 Data worksheets

The data exported from the GRANTA MI database record will be stored in *Data* worksheets.

### 5.1 Named Ranges

Each cell or range of cells where data is to be stored must be identified by defining a *named range*. It is these named ranges that are used in the *Export Lookup* worksheet.

Table 3. Guidance on Named Ranges for all data types

Data Type code	GRANTA MI data type	Usage
DAT	Date	The named range must refer to a single cell where the data is located.
DCT	Discrete	The named range must refer to a single cell where the data is located. See Section 5.8.
DCT	Multi-value Discrete	The named range must refer to adjacent cells where the data is located. See Section 5.8.
FDA	Float Functional (series)	<p>The named range for data values must refer to adjacent cells arranged in a column (or two adjacent columns for range data) for each series.</p> <p>The named range for parameter values must also point to adjacent cells in a single column for each series.</p> <p>All types of series functional data to be exported are described by the same code (FDA), the different types of functional data (e.g. single series or multiple series, point or range) are deduced from the format of the data and whether it is to be interpolated or not. See Section 5.3.1.</p>
FDD	Discrete Functional (series)	<p>The named range for data values must refer to adjacent cells arranged in a column for each series.</p> <p>The named range for parameter values for Parameter 1 must also point to adjacent cells in a single column for each series.</p> <p>The named range for parameter values for Parameter 2 and greater may refer to a single cell for each series.</p>
FIL or FILE	File	The named range for data values must refer to up to five adjacent cells where the data is located. See Section 5.2.

<b>Data Type code</b>	<b>GRANTA MI data type</b>	<b>Usage</b>
GFA	Float Functional (Gridded)	<p>The named range for data values must refer to adjacent cells arranged in a column (or two adjacent columns for range data).</p> <p>The named range for parameter values must also point to adjacent cells in a single column (i.e. the same format as exporting single series data).</p> <p>See Section 5.3.2.</p>
HYP	Hyperlink	The named range must refer to a single cell where the data is located. See Section 5.5.
INT	Integer	The named range must refer to a single cell where the data is located.
LOG	Logical	The named range must refer to a single cell where the data is located.
LTXT	Long Text	The named range can refer to multiple adjacent cells (over multiple rows and/or multiple columns) where the data is located.
MAFN	Equations and Logic	The named range must refer to a single cell where the data is located. The value in the cell is the name of an Expression in the table. See Section 5.6.
PIC	Picture	The named range must refer to a single cell where the data is located. The value in the cell is the file path of the image. The path may be an absolute path, or relative to the template.
PNT	Point	The named range must refer to a single cell where the data is located.
PNT	Multi-Value Point	<p>The named range must refer to adjacent cells where the data is located.</p> <p>The named range for parameter values for each Parameter must also point to adjacent cells. See Section 5.8.</p>
RCLR	Record Color	The named range must refer to a single cell where the data is located. See Section 5.10 for color data values.
RCN	Record Name	The named range must refer to a single cell where the data is located.
RCSN	Record Short Name	The named range must refer to a single cell where the data is located.
RGUID	Record GUID	The named range must refer to a single cell where the data is located.

Data Type code	GRANTA MI data type	Usage
RNG	Range	The named range must refer to two adjacent cells in the same row or column. The first cell will contain the lower value (minimum), the second the higher value (maximum).
STXT	Short Text	The named range must refer to a single cell where the data is located.
SUBSET	Subset	The named range must refer to a single cell where the data is located. The value in the cell is a Boolean value indicating subset membership. See Section 5.11.
TABL	Tabular	The named range for the 'Data range' must refer to multiple adjacent cells in the same column where the ordinal number for each row of tabular data is located.  The named ranges for tabular columns must also point to adjacent cells in a single column for each column. See Section 5.7.

## 5.2 File data

For file attributes, the named range consists of up to five adjacent cells (in a row or column). The cells must always be in the same order, but may be blank.

Table 4. Defining File attributes

Cell #	Cell content
Cell 1	The file name, including the path. The path may be an absolute path, or relative to the template. Use !FILENAME to export the current worksheet.
Cell 2	Text description of the file
Cell 3	The target pane for the file.
Cell 4	Indicates whether the contents of the file are indexed for searching.
Cell 5	Indicates whether the file is displayed instead of the datasheet when MI:Viewer is in read mode.

	A	B	C	D	E	F
1		<b>Document</b>	<b>Doc Description</b>	<b>Target</b>	<b>Indexed</b>	<b>Display as record</b>
2	Record 1	C:\DemoFiles\4391_Ti_Data.txt	test data		TRUE	TRUE
3	Record 2	sample_test_data.txt	test data			TRUE
4	Record 3	!FILENAME	import source	_blank	TRUE	FALSE

Figure 2. Named ranges for exporting a file attribute

In the example above, each row is a record. No column heading is required, but one can be used to make the worksheet easier to interpret. The column heading should not be included in the named range.

The path to the file can be relative or a fully-specified file path.

Files and pictures that are exported are placed into a folder in the same location as the export workbook, and with the same name as the workbook or worksheet, with '*\_files*' appended to the name. For example:

- *Nitrilerubber(NBR,unreinforced)\_files*
- *NBR+PVCblend\_Den=0.04\_files*
- *DataSheet3\_AlmnSlct-1720\_files*

## 5.3 Float functional data

### 5.3.1 Series functional data (FDA)

Series functional data is exported as a set of data series.

On the Data worksheet, named ranges are used to identify the data for the functional attribute in the same way as they are used for non-functional attributes. To distinguish each series in an attribute, each name is suffixed with *\_XX* where *XX* is the series number starting from 01.

On the *Export Lookup* worksheet, the stem of the named ranges is used. At the time of export, the Excel Exporter will assume that the name of the range should be suffixed with *\_XX* for each series, where *XX* is the series number starting from 01.

Each series number must be assigned consecutively: 01, 02, 03 etc.

This suffix convention applies to Data Range, Parameter Range, and Line Type.

When exporting data that will not be re-imported, the named ranges for Data Range and Parameter Range(s) should only be a single cell, or two cells in the case of range data. This is the first row for the data. The Excel Exporter will then add an additional row for each data point being exported. This may overwrite existing values in the cells below the named range.

Where the data will be re-imported, the best practice is to make the named ranges large (ie. more than the number of points in your biggest graph) so that no data ever gets chopped off during a round trip

**Example:** multiple series of data to be exported for a functional data attribute.

- Attribute Name = Tensile Ult. Strength.

The parameters for this attribute are:

- Parameter 1 = Strain (%)
- Parameter 2 = Temperature (°C)
- Parameter 3 = Test Type

On the Export Lookup worksheet:

- The Data Range is set to **TensUltStr\_Value**.
- The Parameter 1 Range is set to **TensUltStr\_Strain**.
- The Parameter 2 Range is set to **TensUltStr\_Temp**.
- The Parameter 3 Range is set to **TensUltStr\_TestType**.
- The Line Type is set to **TensUltStr\_SeriesLineType**.

On the Data worksheet:

- The data values for series 01 are stored in a range named **TensUltStr\_Value\_01**
- The parameter 1 values for series 01 are stored in a range named **TensUltStr\_Strain\_01**
- The parameter 2 values for series 01 are stored in a range named **TensUltStr\_Temp\_01**
- The parameter 3 values for series 01 are stored in a range named **TensUltStr\_TestType\_01**
- The line type for series 01 is stored in a range named **TensUltStr\_SeriesLineType\_01**
- The parameter 1 values for series 02 are stored in a range named **TensUltStr\_Strain\_02**  
and so on.

*Table 3. Guidance on Named Ranges for series functional data*

<b>Type of Functional Data</b>	<b>Usage</b>
Single series of point data	<p>The named range for data values must refer to adjacent cells in a single column.</p> <p>The named range(s) for parameter values must also refer to adjacent cells in a single column.</p>
Single series of range data	<p>The named range for data values must refer to adjacent cells in two adjacent columns, the low value (minimum) being contained in the first, the high value (maximum) in the second.</p> <p>The named range(s) for parameter values must refer to adjacent cells in a single column.</p>
Multiple series of point data	<p>The named range for data values for each series must refer to adjacent cells in a single column.</p> <p>The named range(s) for parameter values for each series must refer to adjacent cells in a single column.</p> <p>These ranges must be named using the suffix convention noted above.</p>

Type of Functional Data	Usage
Multiple series of range data	<p>The named range for data values for each series must point to adjacent cells in two adjacent columns, the lowest value being contained in the first, the high value in the second.</p> <p>The named range(s) for parameter values must refer to adjacent cells in a single column.</p> <p>These ranges must be named using the suffix convention noted above.</p>

### 5.3.2 Gridded functional data (GDA)

Gridded functional data is output as a single table of data. The named ranges are setup in the same manner as for single series functional data (see Section 5.3.1 above).

## 5.4 Discrete functional series data

Discrete functional series (FDD) data is output as a series of text values rather than numeric values. The data is formatted in the same way as numeric *Series functional data (FDA)*, with the exception that Line Type does not apply.

Discrete functional gridded data cannot be exported with the Excel Exporter.

## 5.5 Hyperlink data

The value in this cell will be in the format of an HTML hyperlink. The HTML format consists of an address, target, and description:

```
<a href="address" target="target">Description</a>
```

Where:

- address : the URL of the destination
- target : the target pane for the hyperlink. This can be one of:

Value	Result
MI_CONTENT	Opens the new page in the right pane of MI:Viewer.
MI_TREE	Opens the new page in the left (tree) pane of MI:Viewer.
_top	Opens the new page in the full body of the same browser window. This is useful for leaving the current frameset and creating a frameless page.

Value	Result
<code>_parent</code>	This is similar to "_top" but will refer to the immediate parent of a frame. In more advanced frame usage there may be several nested frames, and this allows more control over which frames are specified.
<code>_blank</code>	Opens the new page in a new browser window, leaving the page with the referring link still open behind it.
<code>_self</code>	Opens the new page within the same frame as the referring link.

- description : a description for the hyperlink. If the attribute did not contain a value for description, the text will be blank.

Example:

```
<a href="http://www.grantadesign.com" target="_blank">Granta - Material Intelligence</a>
```

## 5.6 Equations and Logic data

Equations and Logic data is exported as the name of an expression, a set of parameter extents, and a set of curves.

The parameter extents are the minimum and maximum values, for each numeric parameter, in the attribute. If no value is given for the minimum and maximum, the parameter is assumed to be unbounded. For a discrete parameter, all the values in its extent are exported.

A curve consists of a value for each parameter and a label for the curve. The first curve is the default curve.

On the *Data* worksheet, named ranges are used to identify the data for the equations and logic data.

On the *Export Lookup* worksheet, the stem of the named ranges is used.

- The **Data Range** column contains the stem for the set of curves. The suffix for each curve is '*\_ParamX\_CurveYY*'. Each curve number must be assigned consecutively: 01, 02, 03 etc.
- The **Parameter n Range** columns contain the stem for the parameter extents. The suffix for the numeric parameter extents are '*\_MIN*' and '*\_MAX*'. The suffix for discrete parameter extents are consecutive numbers: 01, 02, 03 etc.

**Example:** an equations and logic attribute.

- Attribute Name = Fatigue model



The parameters for this attribute are:

- Parameter 1 = Number of Cycles
- Parameter 2 = Stress Ratio
- Parameter 3 = Temperature

On the Export Lookup worksheet:

- The Data Range is set to **FatMod**.
- The Parameter 1 Range is set to **Cycles**.
- The Parameter 2 Range is set to **SR**.
- The Parameter 3 Range is set to **Temp**.

On the Data worksheet:

- The name of the expression is stored in a range named **FatMod**.
  - The parameter 1 minimum value is stored in a range named **Cycles\_MIN**.
  - The parameter 1 maximum value is stored in a range named **Cycles\_MAX**.
  - The parameter 2 minimum value is stored in a range named **SR\_MIN**.
  - The parameter 2 maximum value is stored in a range named **SR\_MAX**.
  - The parameter 3 minimum value is stored in a range named **Temp\_MIN**.
  - The parameter 3 maximum value is stored in a range named **Temp\_MAX**.
  - The parameter 1 value for curve 01 is stored in a range named **FatMod\_Param1\_Curve01**.
  - The parameter 2 value for curve 01 is stored in a range named **FatMod\_Param2\_Curve01**.
  - The parameter 3 value for curve 01 is stored in a range named **FatMod\_Param3\_Curve01**.
  - The label for curve 01 is stored in a range named **FatMod\_Label\_Curve01**.
- and so on.

	A	B	C	D	E	F
1						
2		Record Name	Excel Importer record			
3						
4						
5		Model type	Fatigue Model			
6						
7		Cycles	1	10000000		
8		Stress Ratio	2	32		
9		Temperature	23	300		
10						
11			Label	Cycles	Stress Ratio	Temperature
12		Curve 1	Fully reversible	1000	4	317.15
13		Curve 2	Tension	2000	5	328.15
14		Curve 3				
15						

Parameter extents

Curves

Figure 3. Attribute 'Fatigue model'

## 5.7 Tabular data

Tabular data is exported as a set of rows and columns. Data can be exported for all types of tabular column: Local Data, Linked Records, Linked Attribute, and Linked Column columns.

On the *Data* worksheet, named ranges are used to identify the data for the tabular columns.

The named range specified for the 'Data Range' in the *Export Lookup* worksheet contains an ordinal number to identify the rows in the tabular data i.e. 1, 2, 3, 4, etc.

All types of **Local Data** column can be exported. The named ranges for local data columns should be set up in the same way as for attributes of the same data type.

**Example:** a tabular attribute.

- Attribute Name = Substances found in this material

The tabular columns for this attribute are:

- Local Data = CAS Number
- Local Data = Amount
- Linked Records = Substance Name
- Linked Attribute = Status

On the *Export Lookup* worksheet:

- The Data Range is set to **MI\_ROW\_DATA**.
- The Parameter 1 Range is set to **MI\_CAS\_NUMBER**.
- The Parameter 2 Range is set to **MI\_AMOUNT**.
- The Parameter 3 Range is set to **MI\_LINKED\_VALUE**.
- The Parameter 4 Range is set to **MI\_STATUS**.

On the *Parameter Lookup* worksheet (see Figure 13):

- For the parameter 'CAS Number', the Data Range is set to **MI\_CAS\_NUMBER**.
- For the parameter 'Amount', the Data Range is set to **MI\_AMOUNT**.
- For the parameter 'MI LINKED VALUE', the Data Range is set to **MI\_LINKED\_VALUE**.
- For the parameter 'Status', the Data Range is set to **MI\_STATUS**.

For example, data for four tabular columns, *CAS Number*, *Amount*, *Substance Name* (the Linked Records column), and *Status*, is exported for the tabular attribute *Substances found in this material*:

	A	B	C
1	<b>Parameter</b>	<b>Data Range</b>	<b>Unit</b>
2	CAS Number	MI_CAS_NUMBER	
3	Amount	MI_AMOUNT	g
4	MI LINKED VALUE	MI_LINKED_VALUE	
5	Status	MI_STATUS	

Figure 4. Example of Parameter Lookup worksheet for tabular data

On the Data worksheet (see [Figure 14](#)):

- The ordinal number for the row is stored in a range named MI\_ROW\_DATA.
- The data for the tabular column 'CAS Number' is stored in a range named MI\_CAS\_NUMBER.
- The data for the tabular column 'Amount' is stored in a range named MI\_AMOUNT.
- The short text data for the tabular column 'Substance Name' is stored in a range named MI\_LINKED\_RECORDS.
- The data for the tabular column 'Status' is stored in a range named MI\_STATUS.

For example, data for four tabular columns, *CAS Number*, *Amount*, *Substance Name*, and *Status*, is exported for the tabular attribute *Substances found in this material*. Also exported is an ordinal number for each row.

	A	B	C	D	E
1					
2	Record Name	Expoxy resin, high heat			
3					
4	Attribute	Substances found in this material			
5					
6	<b>Row Order</b>	<b>CAS Number</b>	<b>Amount (g)</b>	<b>Substance Name</b>	<b>Status</b>
7	1	101-77	2.5	4-4' -Methylenedianiline	To be phased out
8	2	62-53	0.7	Aniline	To be phased out
9	3	50-01	5.3	Formaldehyde	Restricted

Figure 5. Example of Data worksheet for tabular data

## 5.8 Multi-value data

### 5.8.1 Multi-value discrete

The named range for the Data Range must consist of adjacent cells. You can use cells in multiple columns or cells in multiple rows.

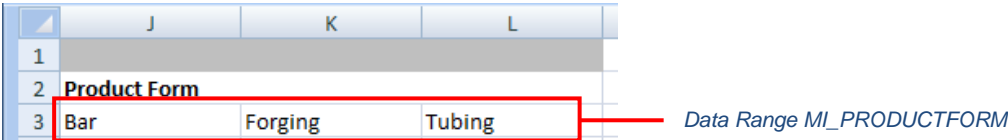


Figure 6. The Data Range for a multi-value discrete attribute 'Product Form'

The named range should be large enough to contain the maximum number of values being exported. For example, suppose you are exporting three records:

Record	Multi-Value Data for the Product Form attribute
Record 1	Bar
Record 2	Extrusion, Rod, Shapes
Record 3	Bar, Bar, Extrusion, Rod, Shapes, Tubing

The named range must contain at least six cells to export all the data from Record 3.

### 5.8.2 Multi-value point

You will require a named range for the Data Range, and one for each Parameter Range. Each named range must consist of adjacent cells. Each named range should be large enough to contain the maximum number of values being exported.

For example, here you can see the Data Range and Parameter Range for a multi-value point attribute *Tension strength* with one discrete parameter *Basis*. The *Export Lookup* worksheet row for this attribute is shown in Section 3.9.

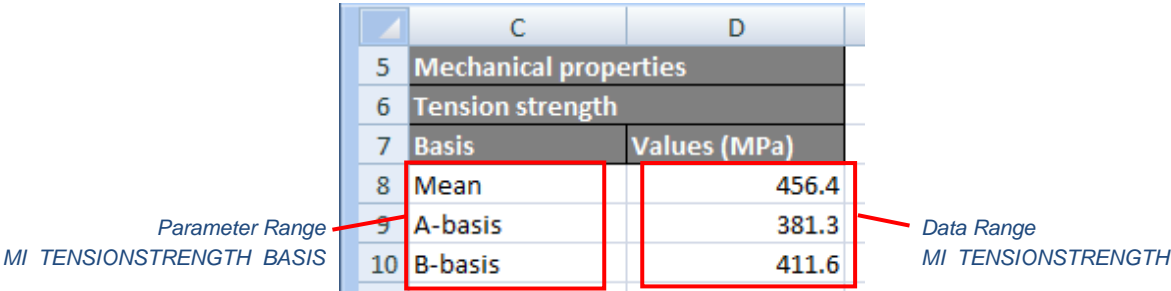


Figure 7. Multi-value point attribute 'Tension strength' with one discrete parameter 'Basis'

## 5.9 Quality ratings

Quality ratings **can** be exported for the following data types: point, integer, range, short text, long text, logical, date, discrete (including multi-value discrete), hyperlink, equations and logic, series functional, and gridded functional.

Quality ratings **cannot** be exported for picture, file, or tabular data, or for points within multi-value point data.

For float functional data, the named range must refer to a column in the *Functional Data* worksheet. For all other types of data, the named range must refer to a single cell where the quality rating for the data will be located.

## 5.10 Record properties

Record properties may be exported as follows.

Property	Data Type	Worksheet	Specimen	Data Range	Import
Record Name	RCN	Data	ROW	MI_RECORDNAME	TRUE
Last Modified Date	RPLMD	Data	ROW	MI_LASTMODIFIEDDATE	TRUE
Last Modified By	RPLMB	Data	ROW	MI_LASTMODIFIEDBY	TRUE
Created Date	RPCD	Data	ROW	MI_CREATEDDATE	TRUE
Created By	RPCB	Data	ROW	MI_CREATEDBY	TRUE
Version State	RPVS	Data	ROW	MI_VERSIONSTATE	TRUE
Short Name	RCSN	Data	ROW	MI_SHORTNAME	TRUE
Record Color	RCLR	Data	ROW	MI_RECORDCOLOR	TRUE
Record GUID	RGUID	Data	ROW	MI_RECORDGUID	FALSE
Record History GUID	HGUID	Data	ROW	MI_RECORDHGUID	FALSE
Record Type	RTYPE	Data	ROW	MI_RECORDTYPE	TRUE
Version Number	RPVN	Data	ROW	MI_VERSIONNUMBER	FALSE

### 5.10.1 Record Color

The record color is specified using the RCLR DataType code. Possible color values are:

0 Red	6 Maroon	12 Gray
1 Lime	7 Green	13 Black
2 Blue	8 Navy	14 White
3 Yellow	9 Olive	15 Silver
4 Fuchsia	10 Purple	
5 Aqua	11 Teal	

### 5.10.2 Record GUID and HGUID

The Record GUID (RGUID) and History GUID (HGUID) may be exported and subsequently used by auto-placement options when the record is imported back into the same database.

For example, here, the named ranges MI\_RECORDGUID and MI\_RECORDHGUID are defined:

	A	B	C	D	E	F	G	H	I	J	K	
1	Attribute Name	DataType	Units	Parent Attr	Worksh	Specime	Data Range	Quality I	Read	Trailing	Import	Li
2	Record Name	RCN			Data	ROW	MI_RECORDNAME				TRUE	
3	Last Modified Date	RPLMD			Data	ROW	MI_LASTMODIFIEDDATE				TRUE	
4	Last Modified By	RPLMB			Data	ROW	MI_LASTMODIFIEDBY				TRUE	
5	Created Date	RPCD			Data	ROW	MI_CREATEDDATE				TRUE	
6	Created By	RPCB			Data	ROW	MI_CREATEDBY				TRUE	
7	Version State	RPVS			Data	ROW	MI_VERSIONSTATE				TRUE	
8	Short Name	RCSN			Data	ROW	MI_SHORTNAME				TRUE	
9	Record Color	RCLR			Data	ROW	MI_RECORDCOLOR				TRUE	
10	Record GUID	RGUID			Data	ROW	MI_RECORDGUID				FALSE	
11	Record HGUID	HGUID			Data	ROW	MI_RECORDHGUID				FALSE	
12	Record Type	RITYPE			Data	ROW	MI_RECORDTYPE				TRUE	
13	Version Number	RPVN			Data	ROW	MI_VERSIONNUMBER				FALSE	
14	Design Data	SUBSET			Data	ROW	MI_DESIGNDATA				TRUE	
15	Metals	SUBSET			Data	ROW	MI_METALS				TRUE	

Figure 8. Record GUID and Record HGUID named ranges on the Export Lookup worksheet

	A	B	C	D	E	F	G	H	I	J	K	
1	Record Properties											
2	Record Name	Last Modified Date	Last Modifie	Created Date	Created By	Version Stat	Short Name	Record	Record GUID	Record HGUID	Recc	
3	Aluminum alloys,	19/06/2020 15:19	[Database In	19/06/2020 15:19	[Database Install]	Unreleased	Sheet	10	80acf80f-6fce-45d9-bd4f-63f0cfd2c	f	ecc	
4												
5												
6												

Figure 9. Record GUID and HGUID data

## 5.11 Subset membership

Subset membership information is exported using the SUBSET DataType. This takes the value 'TRUE' for a given subset if the record belongs to that subset, and blank if it does not belong to the subset.

For example, 5 named ranges on this *Export Lookup* worksheet identify 5 different subsets:

	A	B	C	D	E	F	G	
1	<b>Attribute Name</b>	<b>DataType</b>	<b>Units</b>	<b>Parent Worksheet</b>		<b>Specimen</b>	<b>Data Range</b>	<b>Quality Ra</b>
11	Record Type	RTYPE		Data	ROW		MI_RECORDTYPE	
12	Version Number	RPN		Data	ROW		MI_VERSIONNUMBER	
13	Ceramics	SUBSET		Data	ROW		MI_CERAMICS	
14	Metals	SUBSET		Data	ROW		MI_METALS	
15	All bulk materials	SUBSET		Data	ROW		MI_ALLBULKMATERIALS	
16	Aerospace materials	SUBSET		Data	ROW		MI_AEROSPACE MATERIALS	
17	Polymers	SUBSET		Data	ROW		MI_POLYMERS	
18	Designation	LTXT		Data	ROW		MI_DESIGNATION	MI_DESIG
19	UNS number	STXT		Data	ROW		MI_UNNUMBER	MI_UNSN

Export Lookup | Parameter Lookup | Import Options | Template Information | Export Informatio...

When records are exported, a value of *\_blank\_* is exported for 'not in the subset', and *TRUE* for 'in the subset'. In the example exported data below, the record is a member of the subsets *Metals*, *All bulk materials*, and *Aerospace materials*;

	A	L	M	N	O	P	Q
1	<b>Record Properties</b>	<b>Subsets</b>					<b>Identificat</b>
2	<b>Record Name</b>	<b>Ceramics</b>	<b>Metals</b>	<b>All bulk materials</b>	<b>Aerospace materials</b>	<b>Polymers</b>	<b>Designatio</b>
3	250 maraging steel, maraged at 900F		TRUE	TRUE	TRUE		High alloy
4							
5							

Data | MultiValueData | Attribute Lookup | Export Lookup | Parameter Lookup | Import Options ...

When the record is re-imported back into the database:

- The record is added to any subsets that have a value of TRUE
- The record is removed from any subsets with a value of FALSE. (The parent record is not removed from the subset).
- No action is taken for subsets that are blank.

## 6 Import Options worksheet

The *Import Options* worksheet specifies:

- A list of the tables to which the template applies, that is, the tables from which data can be exported using this template.
- Naming conventions for the generated worksheets and workbook.
- Naming convention used for exported file and picture data (filename and folder name).

Excel templates can be used to both export and import data, and the *Import Options* worksheet also specifies a number of options relating to record placement, auto-linking, conflict resolution, and access control, used when the template is used to import data into the database. These are documented in the *GRANTA MI:Toolbox Excel Import Template Author Guide*.

### 6.1 Valid tables

In the *Import Options* worksheet, you can define a list of tables from which data can be exported. The named range `CES_EXPORT_VALIDTABLES` should be defined in the *Import Options* worksheet to specify the valid tables for the template.

The `CES_EXPORT_VALIDTABLES` named range must refer to a single cell, or range of adjacent cells in a single column, containing the names of the tables from which data can be exported.

The template will only be visible in the Excel Exporter when the user selects records from a table whose name corresponds to one of the tables listed in the template.

If the named range contains no text, the template will be considered valid for all tables.

### 6.2 Exported worksheet naming conventions

In the *Import Options* worksheet, you can set how the workbooks/worksheets created by the export will be named. The named range `MI_SHEETNAME_FORMAT` should be defined in the *Import Options* worksheet to specify the naming scheme, one of:

- Leave the named range blank to use the default naming scheme. See [6.2.1](#).
- Select the 'No vowels' option to use a modified version of the default naming scheme, where worksheet names are shortened by the removal of vowels. See [6.2.2](#).
- Enter an attribute name for a worksheet naming scheme based on that attribute name. See [6.2.3](#).

If the export template generates one worksheet per record (i.e. `Specimen` = 'Worksheet'), then the naming scheme is used to name the worksheets.



If the export template generates one workbook per record (i.e. Specimen = blank), then the naming scheme is used to name the workbook, plus the file extension *'.xls'*.

### 6.2.1 Default worksheet naming scheme

If the MI\_SHEETNAME\_FORMAT named range is **blank**, the default naming scheme is used:

*For one worksheet per record:*

[TemplateWorksheetName][NUMBER][\_][RecordName]}

*For one workbook per record:*

[RecordName]

where

- [TemplateWorksheetName] is the value in the Worksheet column in the *Export Lookup* worksheet;
- [NUMBER] is an index number set by the Excel Exporter;
- [RecordName] is the full name of the record being exported.

For example:

- *DataSheet3\_AluminumT14* (worksheet)
- *Nitrilerubber(NBR,unreinforced).xlsx*

Notes:

- The maximum number of characters allowed by Excel in a worksheet name is 31. It is recommended that a Worksheet name is 10 characters or less.
- If record names are too long to fit in the available space, they are elided in the middle, with an underscore indicating the missing part.
- The available space may vary in the case of exports where the 'Specimen' column in the Export Lookup worksheet is set to 'Worksheet' with different 'Worksheet' names in the rows. In these cases, the longest worksheet name is used when working out the available space to allow the record's suffix to be the same for all worksheets relating to that record.
- In all cases, spaces and forbidden characters \* [ ] \ / ? : " < > | are also removed.
- Any changes to the name will be logged.
- The existence of the numbering in the worksheets prevents duplicate names. The numbering starts at '1'.
- The Excel Importer recognizes the [NUMBER] in the worksheet names and uses those as the index number where they are present, when importing.

## 6.2.2 'No vowels' worksheet naming scheme

If the MI\_SHEETNAME\_FORMAT named range contains 'NO\_VOWELS', then the default naming scheme is modified in the following way:

*For one worksheet per record:*

[TemplateWorksheetName][NUMBER][ ][ RecordName\_without\_vowels]

*For one workbook per record:*

[RecordName\_without\_vowels]

For example:

- *DataSheet3\_AlmnSlct-1720* (worksheet)
- *NtrlRbbr(NBR,unrnfrcd).xls*

If this is still over the 31 character worksheet name limit, the same elision in the middle of the record name, as in the default naming scheme, is used.

## 6.2.3 Attribute value naming scheme

If the MI\_SHEETNAME\_FORMAT named range contains the name of an **attribute**, the naming scheme is:

*For one workbook per record:*

[RecordName][ ][First 3 letters of attribute name][=][attribute Value to 6 s.f.]

*For one worksheet per record:*

[TemplateWorksheetName][NUMBER][ ][First 3 letters of attribute name][=][attribute Value to 6 s.f.]

where

- [RecordName] is the full name of the record being exported.
- [TemplateWorksheetName] is the value in the Worksheet column in the Export Lookup worksheet;
- [NUMBER] is an index number set by the Excel Exporter.

For example:

- *DataSheet3\_Den=0.36* (a worksheet, Density value of 0.04, units not included)
- *NBR+PVCblend\_ Den=0.04.xlsx*

If this is still over the 31 character worksheet name limit, the same elision in the middle of the record name, as in the default scheme, is used.

Attributes of the following data types can be used:

- Date
- Discrete
- Hyperlink
- Integer
- Logical
- Long Text (to a limit of a few characters)
- Point
- Range
- Short Text

Meta-attributes cannot be used. If the attribute name in the template is invalid, then the default naming scheme is used.

### 6.3 *Naming conventions for exported files and folders*

Files and pictures that are exported are placed into a folder in the same location as the export workbook, and with the same name as the workbook or worksheet (as defined in section 6.2), with '*\_files*' appended to the name. For example:

- *Nitrilerubber(NBR,unreinforced)\_files*
- *NBR+PVCblend\_Den=0.04\_files*
- *DataSheet3\_AlmnSlct-1720\_files*

## 7 Exporting multiple records

Although by default the Excel Exporter will create a new workbook for every record it exports, the Excel Exporter can export multiple database records to a single workbook. The individual records can be exported as a single record per row, a single record per column, or a single record per worksheet. This is specified in the Export Lookup worksheet in the **Specimen** column (see Section 3).

- **Row** creates a single row in the worksheet from each record.
- **Column** creates a single column in the worksheet from each record.
- **Worksheet** creates a single worksheet in the workbook from each record.

To use this feature, **Specimen** must be set for the *Record Name* attribute. If the *Record Name* does not have a setting, a setting cannot be used by any other attribute.

If the 'Row' and 'Worksheet' settings are used in combination, then the number of worksheets must equal the number of rows and vice versa.

Similarly, if the 'Column' and 'Worksheet' settings are used in combination, then the number of worksheets must equal the number of columns.

The number of records selected for export is used to determine the number of specimens.

	A	B	C	D	E	F	G	H
	CES Attribute	PARENT ATTRIBUTE	Data Type	Units	Specimen	Worksheet	Data Range	Parameter 1 Range
2	Record Name		RCN		Row	Data	CES_RECORDNAME	
3	Range Attribute		RNG			Data	CES_RANGEDATA	
4	Notes	Range Attribute	DCT			Data	CES_RANGEMETA	
5	Point Attribute		PNT		Row	Data	CES_POINTDATA	
6	Integer Attribute		INT			Data	CES_INTEGERDATA	
7	Short Text Attribute		TXT			Data	CES_SHORTTEXTDATA	
8	Long Text Attribute		TXT			Data	CES_LONGTEXTDATA	
9	Discrete Attribute		DCT			Data	CES_DISCRETEDATA	
10	Logical Attribute		LOG			Data	CES_LOGICALDATA	
11	Date Attribute		DAT		Row	Data	CES_DATEDATA	
12	Functional Point		FDA			Functional Data	CES_FUNCDATA_VALU	CES_FUNCDATA_PAR1
13	Functional Point 2		FDA			Functional Data	CES_FUNCDATA_VALUE	CES_FUNCDATA_PARA1
14	Functional Point 3		FDA			Functional Data	CES_FUNCDATA_VALUE	CES_FUNCDATA_PARA1
15	Functional Range		FDA			Functional Data	CES_RANGEFUNCDATA_VALU	CES_FUNCDATA_PAR1
16	Functional Point 4		FDA			Functional Data	CES_RANGEFUNCDATA_VALUE	CES_FUNCDATA_PARA1

Figure 10. The Specimen column in the Export Lookup worksheet

	A	B	C	D	E	F	G	H
	CES Attribute	PARENT ATTRIBUTE	Data Type	Units	Specimen	Worksheet	Data Range	Parameter 1 Range
2	Record Name		RCN			Data	CES_RECORDNAME	
3	Range Attribute		RNG			Data	CES_RANGEDATA	
4	Notes	Range Attribute	DCT			Data	CES_RANGEMETA	
5	Point Attribute		PNT		Row	Data	CES_POINTDATA	
6	Integer Attribute		INT			Data	CES_INTEGERDATA	
7	Short Text Attribute		TXT			Data	CES_SHORTTEXTDATA	
8	Long Text Attribute		TXT			Data	CES_LONGTEXTDATA	
9	Discrete Attribute		DCT			Data	CES_DISCRETEDATA	
10	Logical Attribute		LOG			Data	CES_LOGICALDATA	
11	Date Attribute		DAT		Row	Data	CES_DATEDATA	
12	Functional Point		FDA		Worksheet	Functional Data	CES_FUNCDATA_VALU	CES_FUNCDATA_PAR1
13	Functional Point 2		FDA			Functional Data	CES_FUNCDATA_VALUE	CES_FUNCDATA_PARA1
14	Functional Point 3		FDA			Functional Data	CES_FUNCDATA_VALUE	CES_FUNCDATA_PARA1
15	Functional Range		FDA			Functional Data	CES_RANGEFUNCDATA_VALU	CES_FUNCDATA_PAR1
16	Functional Point 4		FDA			Functional Data	CES_RANGEFUNCDATA_VALUE	CES_FUNCDATA_PARA1

Figure 11. The Specimen column with incorrect data, no setting for Specimen in the Record Name row

## 7.1 Row data

A new row in the Data worksheet will be created for each record exported. The column containing the record name in the Data worksheet is determined by the information in the 'Record Name' row in the Export Lookup worksheet.

For multiple row data, only the first cell in each column needs to be defined as the named range. This provides the Excel Exporter with the column and first row for the attribute data. Attribute data cells may be empty. Functional data cannot be exported in row data mode.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	TP No.	Temp.	G.L.	Dia.	0.02	E	0.2	Fty	UT	Fty	Elongation	e	Red. dia.	RA	Loc. of
2		deg C	mm	mm	kgf	GPa	kgf	MPa	kgf	MPa	mm	%	mm	%	Fracture
3	T1-4A	700	25.0	6.35	1064	165	2596	804	2827	875	33.95	35.8	5.54	23.9	A
4	T1-3B	600	25.0	6.35	996	154	2899	898	3611	1118	32.35	29.4	5.84	15.4	A
5	T2-12A	600	25.0	6.35	1155	179	2867	888	3209	994	33.45	33.8	5.23	32.2	A
6	T2-13A	700	25.0	6.35	955	148	2613	809	2935	909	32.5	30	6.24	3.4	A
7	H1-6A	600	25.0	6.32	1001	156	2989	934	3711	1160	32.55	30.2	5.34	28.6	A
8	H1-6B	600	25.0	6.35	889	138	2891	895	3422	1060	33.4	33.6	5.09	35.7	A
9	H1-7A	700	25.0	6.35	782	121	2605	807	3122	967	35.95	43.8	3.82	63.8	A
10	H1-7B	700	25.0	6.35	934	145	2508	777	2947	913	36.75	47	3.76	64.9	A
11	H2-6A	600	25.0	6.35	618	96	2545	788	3230	1000	34.1	36.4	5.21	32.7	A
12	H2-6B	600	25.0	6.36	898	139	2999	926	3386	1045	33.35	33.4	5.26	31.6	A
13	H2-7A	700	25.0	6.34	824	128	2619	814	2949	916	36.95	47.8	3.75	65.0	A
14	H2-7B	700	25.0	6.36	897	138	2626	811	2995	925	36.2	44.8	3.81	64.1	A

Figure 12. Example of data in rows. Each row represents the data from a single record.

### To export tabular data with "Specimen = Row"

- Ensure your *Export Lookup* worksheet contains a 'Specimen Number' column.
- In Specimen Number for the attribute row for the tabular attribute, enter the name of a single-cell named range in the worksheet for the tabular attribute.
- As the Excel Exporter writes the tabular data, it will write the number of the specimen (exported record) in the Specimen Number named range for the full height of the tabular data. Other (non-tabular) attributes will be spaced vertically according to the height of the tabular data. The data ranges for these should ideally be horizontally aligned with the data and parameter ranges for the tabular attribute, and with the Specimen Number, so that the result will be a rectangular area for each record exported.

## 7.2 Column data

A new column in the Data worksheet will be created for each record exported. The row containing the record name in the Data worksheet is determined by the information in the 'Record Name' row in the Export Lookup worksheet.

For multiple column data, only the first cell in each row needs to be defined as the named range. This provides the Excel Exporter with the row and first column for the attribute data. Attribute data cells may be empty. Functional data cannot be exported in column data mode.

### 7.3 Worksheet data

A new worksheet in the workbook will be created for each record exported. This works in a similar way as the normal Excel templates. There will be a master Data worksheet that should have exactly the same name as the name in the 'Worksheet' column in the Export Lookup worksheet. This worksheet is then copied and populated with the data for each record. Each new worksheet is named after the name of the record in the database.

However, there are restrictions to the symbols and the number of characters that can be used to name an Excel worksheet. If the record name contains any of these symbols, the symbol will be omitted, and the name truncated to 20 characters.

	A	B	C	D	E
1					
2	<b>Record Name</b>	MTS-572211			
3	<b>Test Temperature</b>	810.9278			
4	<b>0.2% Offset Yield Stress</b>	283.6782			
5	<b>Batch Number</b>	Batch 332			
6					
7					
8	<b>Stress</b>	<b>Strain</b>	<b>DataType</b>		
9	11.47360039	0.00457016			
10	14.49260044	0.00609101			
11	16.9076004	0.00760996			
12	19.9265995	0.00913081			
13	22.34160042	0.0106498			
14	25.36059952	0.0121706			
15	28.37969971	0.0136915			
16	31.39870071	0.0152123			
17	33.81370163	0.016731201			
18	36.83269882	0.018252101			
19	39.85169983	0.019773001			
20	42.26670074	0.0212919			
21	45.28570175	0.0228128			
22	47.70080185	0.0243317			
23	50.71979904	0.0258525			
24	53.13479996	0.0273715			
25	56.15380096	0.028892299			
26	58.56880188	0.030411299			
27	61.58779907	0.031932101			
28	64.60679626	0.033452999			
29	67.02189636	0.0349719			
30	69.43710327	0.036490899			
31	72.45559692	0.0380117			
32	75.47489929	0.039532607			

Figure 13. Data in multiple worksheets. Each record will become a new worksheet in the workbook.

## 8 Exporting trailing zeroes

The Excel Exporter can export trailing zeroes for point data (including multi-value point), range data, and point and range columns in tabular data. There is no special setting in the template to accomplish this. Instead, if the Excel Exporter detects that the data value in the database has trailing zero information, it will automatically export it. This will happen for custom templates and automatically generated templates.

The decimal separator is set to be a period ( . ) character.

For multi-value point data, trailing zeroes can be exported for the attribute value, but not for the parameter value.

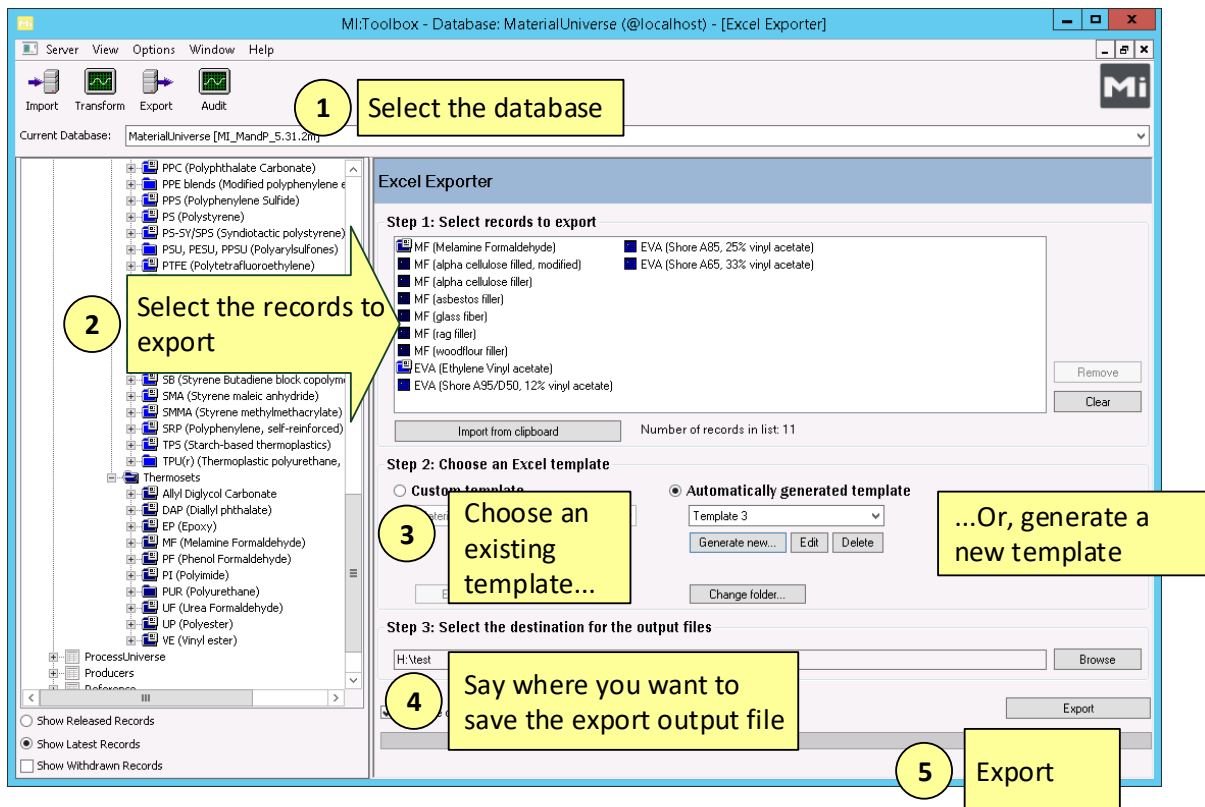
For the trailing zeroes to be preserved during the export, the unit for the attribute in the *Export Lookup* worksheet must be the same as the unit in which the value was originally entered. For example, if a value for Density was originally entered as '7854.0 kg/m<sup>3</sup>', then the value '7854.0' is stored in the database and the Excel Exporter outputs '7854.0' for kg/m<sup>3</sup>. But if the Excel Exporter is set to output in Mg/m<sup>3</sup>, the value is output as '7.854 Mg/m<sup>3</sup>' and the trailing zero will be lost. The user will be warned about the loss of information during the export.

In the output Excel worksheet, the trailing zeroes information will be displayed using the Custom cell formatting setting with the required number of decimal places.

## 9 Using the MI:Toolbox Excel Exporter plug-in

The MI:Toolbox Excel Exporter plug-in may be used

- to export data from a GRANTA MI database to an Excel workbook using an existing Excel template
- to generate new Excel templates for exporting data from (and reimporting data to) a selected database and table



See the help for MI:Toolbox for details of how to use the plug-in to export data.

To ensure data can be exported successfully using the Excel Exporter plug-in:

- All of the template attributes must exist in the database, and match on attribute name and data type (see Section 3, *Export Lookup worksheet*).
- If the attribute name is not matched, then the data for that attribute will not be exported.
- All the template units and any necessary conversion information must exist in the database (see Section 3, *Export Lookup worksheet* and Section 4, *Parameter Lookup worksheet*).
- If no conversion is possible, the export will terminate with an error.
- Any template parameters must exist in the database, and be assigned to the correct attribute (see Section 3, *Export Lookup worksheet*).



If an attempt is made to export functional data containing a parameter not already assigned to the attribute, then the data will not be exported.

- If an attempt is made to export functional data with multiple series where the series number has not been defined correctly, the data will not be exported for that attribute.
- The named ranges defined for a single series functional attribute should not be the same as the stem of the named ranges defined for multiple series functional attributes. The suffix convention will not distinguish between different attributes and problems will occur.

The Excel Exporter can “auto generate” new templates. You can specify:

- The attributes to export
- The unit system to use for the exported data
- The output Excel worksheet format (.xlsx or .xls)
- Whether or not to include an identifier that enables record data to be imported back to the same record.
- Whether or not to export the ‘estimated’ flag for single-value point and range data.
- Whether or not to export the quality rating values for supported data types.
- Whether or not to export subset membership for each exported record.
- How to handle functional attributes

Templates generated in the plug-in (‘automatically generated templates’) are saved as Excel workbooks, and can be used again when exporting from the same database and table.

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**Note:** Equations and Logic (EEL) attributes will not be included in automatically generated templates. If you need a template that can export/import EEL attributes, it will be necessary to edit the auto generated template in Microsoft Excel to add the required expression, parameter, and curve details, as specified in Section 5.6.

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Auto generated templates are saved locally, and can subsequently be edited, as required, in Microsoft Excel or in the Excel Exporter plug-in; see [Section 8.3, Location of Excel Exporter templates](#).

Refer to the MI:Toolbox Help for details of how to create autogenerated templates for the Excel Exporter.

## 10 Location of Excel Exporter templates

### 10.1 Automatically-generated templates

By default, all automatically-generated templates created in the Excel exporter plug-in are stored in the *AutoTemplates* folder located in the user's local application data folder, for example:

```
%LOCALAPPDATA%\Granta Design\MI\Toolbox\Export\AutoTemplates
```

Users can specify a different folder from within the Excel Exporter plug-in by clicking **Change folder** and specifying the new location.

### 10.2 Custom templates

By default, the Excel Exporter looks for custom templates in a *Templates* folder located with the plug-in. For example:

```
C:\Program Files\Granta\GRANTA MI\Toolbox\plugins\Exporters\Excel\Templates
```

This location is shared with all users of the computer on which MI:Toolbox is installed. (Each user can also specify additional custom template folders by clicking **Edit folders** under the **Custom template** option.)

## Appendix A. Example Excel template worksheets

### A.1 Sample 'Export Lookup' worksheet

Attribute Name	Data Type	Units	Parent Att Worksheet	Specimen	Data Range	Quality R.	Read Trail	Import	Show As Table	Parameter 1 Range	Parameter 2 Range
89 Soak Time	PNT	min	Data		MI_SOAKTIME			TRUE	TRUE		
90 Control Mode	DCT		Data		MI_CONTROLMODE			TRUE	TRUE		
91 Strain Rate	PNT	% strain/s	Data		MI_STRAINRATE			TRUE	TRUE		
92 Strain Rate is Equivalent	LOG		Data		MI_STRAINRATEISEQUIVALENT			TRUE	TRUE		
93 Loading Rate	PNT	ksi/s	Data		MI_LOADINGRATE			TRUE	TRUE		
94 Crosshead Speed	PNT	in/s	Data		MI_CROSSHEADSPEED			TRUE	TRUE		
95 Tensile Response (11-axis)	FDA	ksi	TensileResp.WORKSHEET		MI_TENSILERESPONSE11AXIS			TRUE	FALSE	MI_TENSILERESPONSE11AXIS_STRAIN	MI_TENSILERESPONSE11AXIS_STRAIN
96 Young's Modulus (11-axis)	PNT	10 <sup>6</sup> psi	Data		MI_YOUNGSMODULUS11AXIS			TRUE	TRUE		
97 Young's Modulus (22-axis)	PNT	10 <sup>6</sup> psi	Data		MI_YOUNGSMODULUS22AXIS			TRUE	TRUE		
98 Young's Modulus (33-axis)	PNT	10 <sup>6</sup> psi	Data		MI_YOUNGSMODULUS33AXIS			TRUE	TRUE		
99 Young's Modulus Calculation	DCT		Data		MI_YOUNGSMODULUSCALCULATION			TRUE	TRUE		
100 Modulus Calculation Range	LXT		Data		MI_MODULUSCALCULATIONRANGE			TRUE	TRUE		
101 Secondary Modulus (11-axis)	PNT	10 <sup>6</sup> psi	Data		MI_SECONDARYMODULUS11AXIS			TRUE	TRUE		
102 Secondary Modulus Calculation	DCT		Data		MI_SECONDARYMODULUSCALCULATION			TRUE	TRUE		
103 Elastic Poisson's Ratio (12-plane)	PNT		Data		MI_ELASTICPOISSONSRATIO12PLANE			TRUE	TRUE		
104 Elastic Poisson's Ratio (13-plane)	PNT		Data		MI_ELASTICPOISSONSRATIO13PLANE			TRUE	TRUE		
105 Elastic Poisson's Ratio (23-plane)	PNT		Data		MI_ELASTICPOISSONSRATIO23PLANE			TRUE	TRUE		
106 Proportional Limit	PNT	ksi	Data		MI_PROPORTIONALLIMIT			TRUE	TRUE		
107 0.02% Offset Yield Stress	PNT	ksi	Data		MI_002OFFSETYIELDSTRESS			TRUE	TRUE		
108 0.2% Offset Yield Stress	PNT	ksi	Data		MI_02OFFSETYIELDSTRESS			TRUE	TRUE		
109 User Defined Offset	PNT	%	Data		MI_USERDEFINEDOFFSET			TRUE	TRUE		
110 User Defined Offset Yield Stress	PNT	ksi	Data		MI_USERDEFINEDOFFSETYIELDSTRESS			TRUE	TRUE		
111 Yield Point Calculation	DCT		Data		MI_YIELDPOINTCALCULATION			TRUE	TRUE		
112 Ultimate Tensile Strength	PNT	ksi	Data		MI_ULTIMATESTRENGTH			TRUE	TRUE		
113 Strain at Ultimate Tensile Strength	PNT	%	Data		MI_STRAINATULTIMATESTRENGTH			TRUE	TRUE		
114 Tensile Failure Stress	PNT	ksi	Data		MI_TENSILEFAILURESTRESS			TRUE	TRUE		
115 Strain at Tensile Failure	PNT	%	Data		MI_STRAINATFAILURE			TRUE	TRUE		
116 Elongation	PNT	%	Data		MI_ELONGATION			TRUE	TRUE		
117 Measured Elongation	PNT	in	Data		MI_MEASUREDELONGATION			TRUE	TRUE		
118 Permanent strain at zero load	PNT	%	Data		MI_PERMANENTSTRAINATZEROLOAD			TRUE	TRUE		
119 Reduction in Area	PNT	%	Data		MI_REDUCTIONINAREA			TRUE	TRUE		
120 Hardening Modulus 1	PNT	ksi	Data		MI_HARDENINGMODULUS1			TRUE	TRUE		
121 Hardening Modulus 2	PNT	ksi	Data		MI_HARDENINGMODULUS2			TRUE	TRUE		

### A.2 Sample 'Parameter Lookup' worksheet

Parameter	Data Range	Units
2 Time	MI_TESTTEMPERATUREVSTIME_TIME	hr
3 Strain	MI_TENSILERESPONSE11AXIS_STRAIN	% strain
4 Data Type Lab	MI_TENSILERESPONSE11AXIS_DATATYPELAB	
5 Strain	MI_TENSILERESPONSE22AXIS_STRAIN	% strain
6 Strain	MI_TENSILERESPONSE33AXIS_STRAIN	% strain
7 Time	MI_STRESSVSTIME_TIME	hr
8 Displacement	MI_LOADVSDISPLACEMENT_DISPLACEMENT	in
9 Strain	MI_LOADSTRAIN11AXIS_STRAIN	% strain
10 Time	MI_LOADTIME11AXIS_TIME	hr
11 Time	MI_STRAIN11AXISVSTIME_TIME	hr
12 Time	MI_STRAIN22AXISVSTIME_TIME	hr
13 Time	MI_STRAIN33AXISVSTIME_TIME	hr
14 Strain	MI_POISSONSRATIO12PLANEVSSTRAIN_STRAIN	% strain
15 Strain	MI_POISSONSRATIO13PLANEVSSTRAIN_STRAIN	% strain
16 Strain	MI_POISSONSRATIO23PLANEVSSTRAIN_STRAIN	% strain

### A.3 Sample 'Data' worksheet

