

TSI Link™ Trend Analysis



Workbook Guide (US)

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Overview

The Trend Analysis workbook contains a set of worksheets for TSI Link™ Report Creator that support trending a sequence of measurements over time. Trend analysis is useful for a wide variety of industrial and commercial applications, including:

- Understanding seasonality (yearly, weekly, daily, etc.) of an environment
- Spotting patterns in data at given location
- Extrapolating or predicting future outcomes
- Ensuring that an industrial process remains under control
- Verifying that an engineering control remains effective
- Checking that external factors do not adversely impact the environment

The templates in this workbook include data visualizations to help the user better understand trending. It supports a variety of measurands including sound, particulate matter, and gases. Each worksheet is described below.

If you are new to Report Creator, check out the [Report Creator Product Page](#) for guides and videos including: setting up an account, installing the application, using the study manager, using the layout view, customizing report creator templates, etc. This application guide builds upon those guides, it does not duplicate them.

Workbook Templates

The table below lists the worksheets available in the Trend Analysis workbook.

Worksheet Template	Supported Measurements	Supported Instruments	Examples of Applications
PM & VOC Control Chart PM & VOC Whisker Chart	VOC (ppb) PM 2.5 (ug/m ³) NC 0.3 – 0.5 um NC 0.5 – 1.0 um NC 1.0 – 2.5 um NC 2.5 – 4.0 um NC 4.0 – 10 um	OmniTrak™	Studying a process or system over a typical cycle: school day, working shift, manufacturing process, cleaning process, clean up, remediation, etc. Studies in which the span of trends – min, max and range per period – are especially important.
Configurable Control Configurable Whisker	The Configurable Reports allows you to select up to three measurements in a study from a large list. This configuration is made at the bottom of the Cover worksheet. See the Configurable Report section for more detail.		

Worksheet Operation

The worksheet templates in this workbook have a similar structure. This section outlines the basic operating steps for all of them. Any unique aspects of the worksheets are discussed at the end of the section.

Step 1 Select a Worksheet

The Trend Analysis Workbook is one of many that are available. An overview of the workbooks available is on the Report Creator product page.

The overview of worksheets in the prior section provides guidance on the Trend Analysis Worksheets. Choose the one that meets your reporting needs.

Selecting Configurable Report Name and Parameters

The worksheets discussed above import specific measurement data. But the TSI® instrument portfolio can generate a wide range of measurements. It would be impractical to create templates for all possible permutations. The *Configurable Reports* provides a way for you to define a trend analysis for any three measurements you like.

The configuration is performed at the bottom of the *Cover* sheet.

49	Custom Template Configuration	
50	Template Name	Acoustic Barrier Performance
51		
52	Parameters	
53	Choice 1	LASmax
54	Choice 2	LApeak
55	Choice 3	LZpeak
56		
57		

You can give the Configurable Report a unique name, if desired. Then select up to three measurements. In the example below, three sound level measurements were selected to check performance of an acoustic barrier.

Save the workbook template and open **Report Creator**. You will see your name appear in the worksheet selection list.

When you add the worksheet, you will see all the parameters you have selected.

The screenshot shows the TSI Link Report Creator interface. The main window displays a worksheet titled "Test Scores vs Air Quality" with the following structure:

- Row 1:** Worksheet title "Test Scores vs Air Quality" and an "ID:" field.
- Row 3:** "Demographic Information" section with fields for "Location", "Conditions", "Date:", and "Comments:".
- Row 11:** "Correlation Data" section with a "Variable" column and "Selected Parameters" columns for "Max PM 2.5 (ug/m3)", "Avg PM 2.5 (ug/m3)", "Max CO2 (ppm)", and "Avg CO2 (ppm)".
- Row 13:** "Study" column with entries for "Study 1" and "Study 2".

Annotations in the image include:

- A red arrow pointing to the worksheet title "Test Scores vs Air Quality" labeled "Template Name".
- A red box around the demographic information fields.
- A red arrow pointing to the "Variable" column in the correlation data table labeled "Manually Input Variables for Correlation".
- A red box around the "Max PM 2.5" and "Avg PM 2.5" columns labeled "Selected Parameters".

The right-hand sidebar shows the "TSI LINK" logo, a "Workbook" section with "Correlation Analysis" and "Add" button, and a "Worksheet" section with "Test Scores vs Air Quality" and "Add" button. A note at the bottom of the sidebar states: "1 to 10 studies (minimum of 1) are needed to complete worksheet. Data can also be added manually".

Step 2 Cover Sheet

This workbook contains a very simple Cover sheet that can be customized to suit your needs. See the *Customizing Report Creator Templates to learn how*. Other sheets can be added to your workbook, if desired.

The bottom of the Cover sheet includes a configuration tool for the **Configurable Report**. This report is discussed below. If the Cover sheet is deleted from the workbook, the Configurable Report will not be functional.

The screenshot shows a "Cover Sheet" form titled "Trend Analysis Report". It contains four input fields:

- Client
- Project
- Location
- Author

Step 3 Enter Demographic Information

After you have created a blank worksheet, you can enter whatever demographic information you want into your report.

The screenshot shows a "Demographic Information" form titled "PM & VOC Control Chart". It contains four input fields:

- Location
- Conditions
- Date:
- Comments:

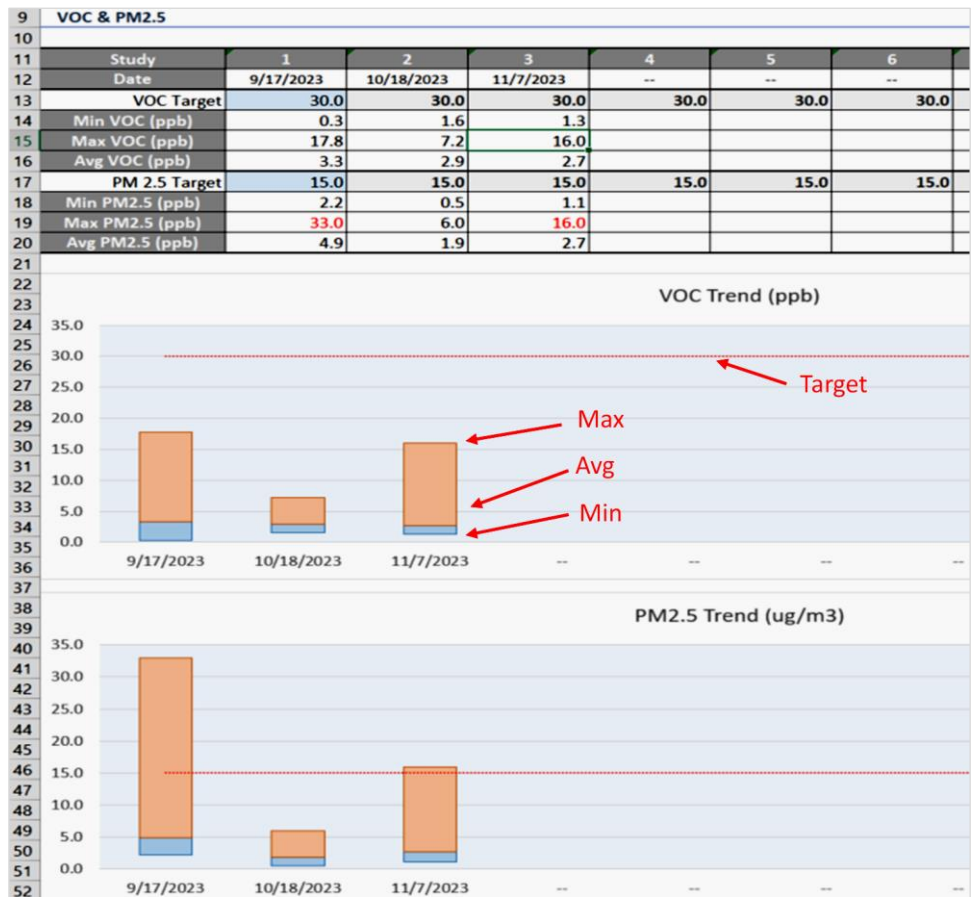
Step 4 Import Study Data

Typically, trend analysis studies are performed over a period of time. You will likely be importing a new study at some established period – every hour, day, week, month, etc. Simply select the latest study and **click Add Data** to import data into the worksheet. Data files are typically loaded via the [Study Manager](#). This feature securely saves and backs up the data and makes it easier to move data from the devices to the Report Creator Application. Alternatively, data can be Imported.

Step 5 Analyze Data

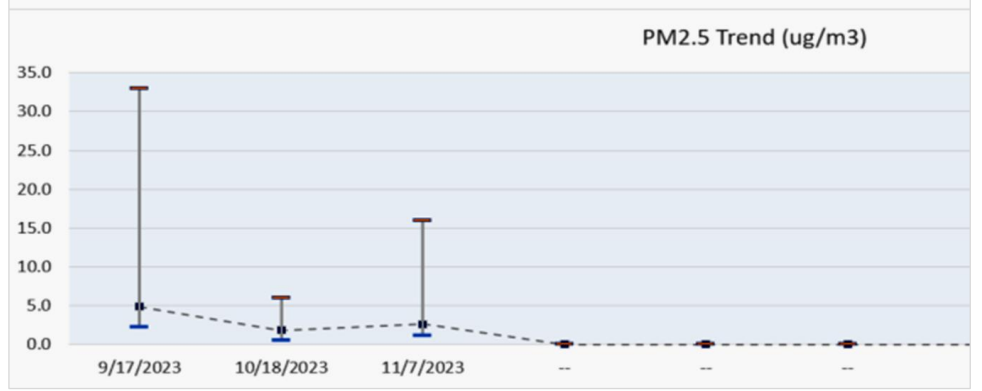
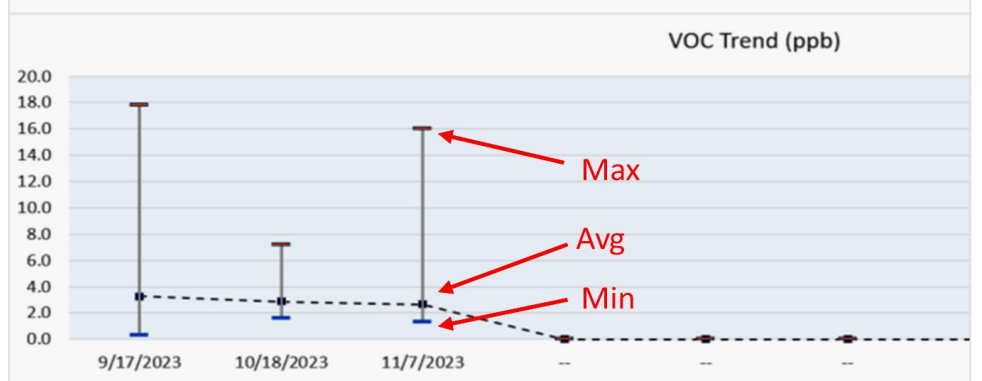
The **Test Results** section includes tables that display minimum, maximum, and average for each measurement. If a target value has been entered and the limit is exceeded, the cell text is highlighted in **red**.

The *control chart* worksheet includes a column chart as shown in image. The average value is the line between the blue and tan bars. Minimum is the bottom of the blue bar. Maximum is the top of the tan bar. Target limits are shown as a dotted red line.

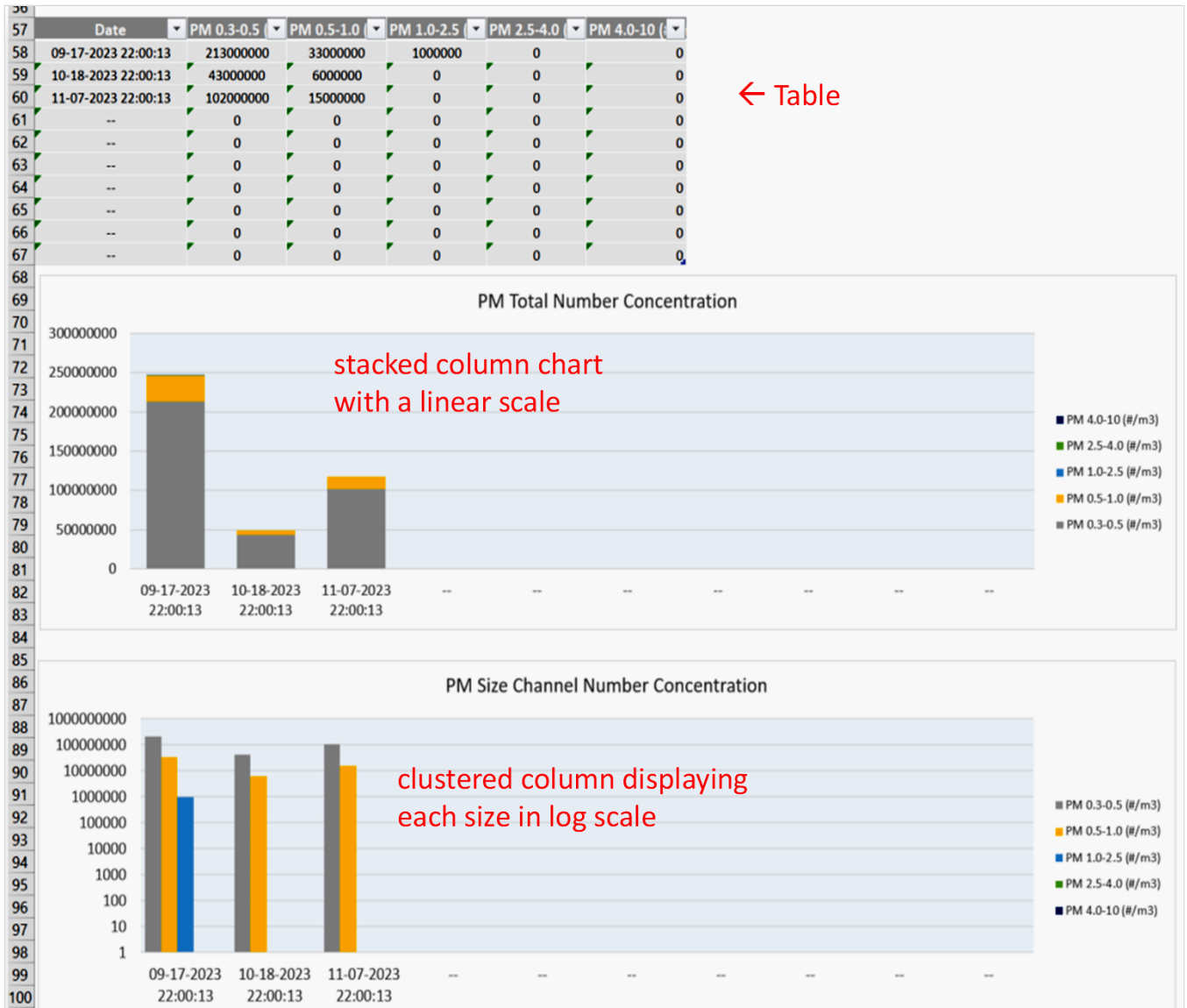


The *whisker chart* worksheet has a slightly different visualization. Averages are a bar connected with a dashed line. Min and max are the “whiskers” of the line. Due to limitations of Excel® whisker charts, control limits cannot be displayed on these charts.

VOC & PM2.5						
Study	1	2	3	4	5	6
Date	9/17/2023	10/18/2023	11/7/2023	--	--	--
VOC Target	30.0	30.0	30.0	30.0	30.0	30.0
Min VOC (ppb)	0.3	1.6	1.3			
Max VOC (ppb)	17.8	7.2	16.0			
Avg VOC (ppb)	3.3	2.9	2.7			
PM 2.5 Target	15.0	15.0	15.0	15.0	15.0	15.0
Min PM2.5 (ppb)	2.2	0.5	1.1			
Max PM2.5 (ppb)	33.0	6.0	16.0			
Avg PM2.5 (ppb)	4.9	1.9	2.7			



PM number concentration is displayed in three ways: a table, a stacked column chart with a linear scale showing total number concentration, and a clustered column displaying each size in log scale.



The Trending Charts and Tables can be complimented by pictures or floor plans of the measurement area. [The Layout View](#) provides the ability to display summary metrics on a photo, diagram, map, or other image

Step 6 Complete the Assessment

To complete the report, you can add recommendations under the Conclusions section.

The print layout for this sheet does not include the measurement data in the blue tables at the bottom of the sheet. They will not appear in a PDF export either

Appendix A – Configuration Sheet Parameters

Below is a list of the 69 parameters available for the configuration template. This large set of options provide extraordinary flexibility for your A-B analysis.

Parameter	Description	Units
PM1.0	PM 1.0 (ug/m ³)	MICROGRAMS_PER_CUBIC_METER
PM2.5	PM 2.5 (ug/m ³)	MICROGRAMS_PER_CUBIC_METER
PM4.0	PM 4.0 (ug/m ³)	MICROGRAMS_PER_CUBIC_METER
PM10	PM 10 (ug/m ³)	MICROGRAMS_PER_CUBIC_METER
PN0.5	NC 0.3 - 0.5 (#/m ³)	COUNT_PER_CUBIC_METER
PN1.0	NC 0.5 - 1.0 (#/m ³)	COUNT_PER_CUBIC_METER
PN2.5	NC 1.0 - 2.5 (#/m ³)	COUNT_PER_CUBIC_METER
PN4.0	NC 2.5 - 4.0 (#/m ³)	COUNT_PER_CUBIC_METER
PN10	NC 4.0 - 10 (#/m ³)	COUNT_PER_CUBIC_METER
CO ₂	CO ₂ (ppm)	PARTS_PER_MILLION
CH ₂ O	CH ₂ O (ppb)	PARTS_PER_BILLION
CO	CO (ppm)	PARTS_PER_MILLION
SO ₂	SO ₂ (ppb)	PARTS_PER_BILLION
Ozone	Ozone (ppb)	PARTS_PER_BILLION
NO ₂	NO ₂ (ppb)	PARTS_PER_BILLION
CL	CL (ppm)	PARTS_PER_MILLION
NH ₃	NH ₃ (ppm)	PARTS_PER_MILLION
VOC	VOC (ppb)	PARTS_PER_BILLION
LZSmax	LZSmax (dB)	DECIBELS
LZFmax	LZFmax (dB)	DECIBELS
LZlmax	LZlmax (dB)	DECIBELS
LZSmin	LZSmin (dB)	DECIBELS
LZFmin	LZFmin (dB)	DECIBELS
LZlmin	LZlmin (dB)	DECIBELS
LASmax	LASmax (dB)	DECIBELS
LAFmax	LAFmax (dB)	DECIBELS
LAlmax	LAlmax (dB)	DECIBELS
LASmin	LASmin (dB)	DECIBELS
LAFmin	LAFmin (dB)	DECIBELS
LAlmin	LAlmin (dB)	DECIBELS
LCSmax	LCSmax (dB)	DECIBELS
LCFmax	LCFmax (dB)	DECIBELS
LClmax	LClmax (dB)	DECIBELS
LCSmin	LCSmin (dB)	DECIBELS
LCFmin	LCFmin (dB)	DECIBELS
LClmin	LClmin (dB)	DECIBELS
LZeq	LZeq (dB)	DECIBELS
LZpeak	LZpeak (dB)	DECIBELS
LCeq	LCeq (dB)	DECIBELS
LCpeak	LCpeak (dB)	DECIBELS

(continued on next page)

Parameter	Description	Units
LAeq	LAeq (dB)	DECIBELS
LApeak	LApeak (dB)	DECIBELS
LZS	LZS (dB)	DECIBELS
LZF	LZF (dB)	DECIBELS
LZI	LZI (dB)	DECIBELS
LCS	LCS (dB)	DECIBELS
LCF	LCF (dB)	DECIBELS
LCI	LCI (dB)	DECIBELS
LAS	LAS (dB)	DECIBELS
LAF	LAF (dB)	DECIBELS
LAI	LAI (dB)	DECIBELS
LAleq	LAleq (dB)	DECIBELS
LAe	LAe (dB)	DECIBELS
LAeq t80	Laeq t80 (dB)	DECIBELS
LAft m3	LAft m3 (dB)	DECIBELS
LAft m5	LAft m5 (dB)	DECIBELS
LAit m3	LAit m3 (dB)	DECIBELS
LAit m5	LAit m5 (dB)	DECIBELS
Lavg1 t1nn q1n	Lavg1 t1nn q1n (dB)	DECIBELS
Lavg2 t2nn q2n	Lavg2 t2nn q2n (dB)	DECIBELS
LCeq-LAeq	LCeq-LAeq (dB)	DECIBELS
Lex 8hr	Lex 8hr (dB)	DECIBELS
Lep d	Lep d (dB)	DECIBELS
Proj Lex 8hr	Proj Lex 8hr (dB)	DECIBELS
Lroj lep d	Lroj lep d (dB)	DECIBELS
TWA 8hr	TWA 8hr (dB)	DECIBELS
Proj TWA 8hr	Proj TWA 8hr (dB)	DECIBELS
Dose %	Dose % (dB)	DECIBELS
Proj Dose %	Proj Dose % (dB)	DECIBELS



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