QI Macros For All Versions of Excel 2000-2014 Table of Contents

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Installing the QI Macros

From Download:

- Save the QIMacros230.zip file on your PC or Mac
- Close Excel
- Extract files from the zip folder
- Run the Installation Wizard
 - **PC:** Open the QI Macros PC Folder and double click on QIMacrosSetup.exe to run the wizard.

MAC: Open the QI Macros MAC Folder and double click on QIMacros.dmg to run the wizard.

From CD:

- Close Excel.
- Insert CD and open to view contents.
- PC Double click on QIMacrosSetup.exe to run the installation wizard.
- MAC Open the QI Macros MAC Folder and double click on QIMacros.dmg to run the installation wizard.

Installation Troubleshooting

If the installation wizard ran, but the QI Macros menu does not appear on your Excel toolbar, the QI Macros file has most likely been disabled by Excel. See easy fix to enable the file on page 33 or at: **qimacros.com/support/qi-macros-techsupport/#NoMenu**

Tech Support:

- qimacros.com/support/qi-macros-tech-support
- Email: support@qimacros.com (Attach a copy of your data in Excel, if applicable)
- Call: 888.468.1537 or 303.756.9144

Excel 2007, 2010 & 2013 Ribbon Menu

Excel 2007, 2010 & 2013 have a different user interface from previous versions of Excel called "the ribbon." When properly installed, the QI Macros will appear in the far right of the ribbon.

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ADD-INS QI Macros 2014

Click on QI Macros to reveal the QI Macros functions. Any menu with an arrow to the right has a menu of further options.

FILE	HOME	INSERT	PAGE LAYOUT	FORMULAS	DATA	REVIEW	VIEW	DEVELOPER	ADD-INS	QI Macros 2014	
Stat Wizard Lean Tools * Improvement Tools *				PivotTak	ole Wizard	Box,	Dot & Values F	Plot -	Control Chart Wiza	rd	
Statistical	Statistical Tools - Diagrams - DOE GageR&R FMEA -		8:R FMEA ▼	Word Count		Histograms & Capability •			Control Charts (SPC	- (2	
Stat Templates • Calculators • Planning & PM Tools •		PM Tools -	Restacking -		Capa	Capability Templates *		Control Chart Temp	olates -		
Statistical Tools Templates for Lean Six Sigma		Sigma	Data	Mining		Capability Charts		Control Chart	s		

Excel for Mac and Excel 2000-03 Menu

When properly installed on a Mac or older version of Excel, the QI Macros will appear in the far right part of the menu. Click on QI Macros to access all of its features.

```
Eile Edit View Insert Format Tools Data Window Help QI Macros 2014
```

Licensing:

The QI Macros is a Single User License. You need to buy one license for each user or computer.

Home/Office Edition: For one user with two computers (desk-top/laptop, home/office, PC/Mac). Add a 2nd computer for a single user at: **qimacros.com/store/add-w244**/

About this User Guide

This booklet covers use of the QI Macros. It will *not* cover Excel, SPC, or Lean Six Sigma. See **www.qimacros.com** for other resources addressing these topics.

QI Macros Overview

The QI Macros Consists of Four Parts:

1. Macros	Control Charts, Histograms, Line, Run, Scatter, Pareto, Bar, Pie, Box and Whisker, Multi Vari
2. Templates	SPC Charts, Dashboards, Flowcharts, Fishbones, DOE, Gage R&R, QFD, FMEA, PPAP, Value Stream Maps
3. Statistics	ANOVA, F-Test, t-Test, Chi-Squared, Correlation, Regression, Sample Size Calculator
4. Data	PivotTable Wizard, Count Words, Stack/Restack Tables, Paste/Link Transpose

Works Right in Microsoft Excel

Other software packages make you transfer your Excel data into special tables within their application, but not the QI Macros.

Just click and drag over the data in your Excel spreadsheet and click on the chart or analysis you want to run from the QI Macros menu.

Sample Data

The QI Macros loads sample data for each chart and statistical tool on your computer at: **Documents\QIMacrosTestData**

Use this data for examples of how to set up your data and to practice running charts.

Video Tutorials

Watch "how-to" videos for many QI Macros tools at: **qimacros.com/qi-macros/video-tour**

QI Macros Wizards

The QI Macros is the only Six Sigma SPC software that provides Wizards to automatically choose charts based on your data.

We have found that beginning and even experienced Six Sigma users aren't always sure what chart or tool to use. Because users select their data before they draw a chart or run a statistic, the QI Macros can easily determine the best charts, statistics or organization for the data.



The QI Macros has several wizards to assist in choosing the right chart or statistic:

- Chart Wizard chooses the right charts for your data: descriptive statistics, pareto charts, control charts, histograms, box and whisker charts, scatter charts, etc.
- Control Chart Wizard chooses the right control chart for your data from: c, np, p, u, XmR, XbarR, or XbarS.
- PivotTable Wizard creates a PivotTable when you select up to four columns of data.
- Statistics Wizard will analyze your data and choose the right hypothesis tests for you. Hypothesis testing determines if the means and variances of two or more samples are the same or different. The Stat Wizard will figure it out and tell you in no uncertain terms. No more p values to evaluate.

For more information see: qimacros.com/qi-macros/wizards/

QI Macros Chart Wizard

You've Collected Your Data - Now What?

If you are like many of our users, you are confused about which chart to use to analyze your data. Rather than having to find your way through a forest of decision trees, wouldn't it be great if the decision tree was already coded into the software?

In the QI Macros, it is!

Just select your data, click on the QI Macros menu and then Chart Wizard. The QI Macros will analyze your data, run descriptive statistics and create the most probable charts.

Chart Wizard Results include:

- Descriptive Statistics with a Histogram, Box Plot, Confidence Intervals, Normal Probability Plot
- One of several Control Charts
- Pareto, Scatter, or Box and Whisker Plot

Chart Wizard Selection Highlights

Columns	1	2	3-9	10+
Integers or Decimals	Pareto Chart if headings not dates	Scatter Plot		
Integers c chart		p, u, np chart		
Decimals Normal	XmR	XbarR Box Whisker	XbarR Box Whisker	XbarS Box Whisker
Decimals Non- Normal	XmR Median	XmedianR Box Whisker	XmedianR Box Whisker	XbarS Box Whisker

For more info, see qimacros.com/quality-tools/chart-wizard/

Control Chart Wizard

Choosing the right control chart depends on your data-attribute (counted) or variable (measured)-and the sample size.

	Number in Sample						
Type of data	1	2-or-more	Varies				
Fraction Defective		np	р				
Number of defects		с	u				
Time, length, weight, \$	XmR	XbarR	XbarR				
(Measured)		XbarS	XbarS				

You can select the control chart yourself or let the QI Macros Control Chart Wizard analyze your data and select one for you.

To use the Control Chart Wizard:

- 1. Highlight the labels and data to be graphed.
- 2. From the QI Macros Menu, select Control Chart Wizard.
- **3.** The wizard will analyze your data and select the correct chart for you. If it needs to determine between two possible charts, you may be prompted for a question like:



Resources for selecting your own chart include:

- The SPC Quick Reference Card at: qimacros.com/pdf/spcfree-training.pdf
- Free article at: qimacros.com/free-excel-tips/choosingcontrol-charts

QI Macros Statistics Wizard

The Statistics Wizard will analyze your data and choose the right hypothesis tests for you.

Hypothesis testing can seem complex and challenging, but it basically wants to know if the means and variances of two or more samples are the same or different. The Stat Wizard will tell you in no uncertain terms. No more p values to evaluate.

- 1. To use the Stat Wizard organize your data into columns. See sample data sets at: **Documents\QIMacrosTestData\anova**
- 2. Select your data then choose Stat Wizard from the QI Macros toolbar. The wizard will determine the number of columns of data and whether the data is decimals or integers. Based on that information, it will run the following statistics:

1 Column	Descriptive Statistics 1 Sample t Test for Means
2 Columns	f Test for Variances t Test for Means Chi-Square Table for independence (if data is integers) Fisher's test for 2X2 tables, Regression
3+ Columns	ANOVA for Means Levene's Test for Variances Chi-Square Table for independence (if data is integers)

The QI Macros results will answer these questions for you:

- Is your data normal?
- Reject or Accept the Null Hypothesis?
- Are the Means or Variances the same or different?

Learn more:

qimacros.com/hypothesis-test/statistics-wizard-excel qimacros.com/hypothesis-test/hypothesis-testing-excel

QI Macros PivotTable Wizard

If you are like many Excel users, you struggle with creating PivotTables in Excel. However, PivotTables are a valuable tool that every quality improvement professional should learn to use.

The QI Macros makes creating PivotTables easy. Here is how:

- 1. Make sure each column in your data sheet has a heading and that there are no blank rows or columns separating the data you want in the PivotTable.
- 2. In the data sheet, use the Ctrl key to select up to four column headings for the data you want included in the PivotTable.

		POST		ADM DIS					DENIED	
1	Region	DATE	ENT	DATE	DATE	FC	IN1	PT	CHARGES	
2	North	6/27/03	Hosp1	2/13/03	1/1/00	Х	AEH	0	543.07	
3	South	12/24/02	Hosp2	7/13/02	1/1/00	Х	BCP	Е	215.4	
4	South	2/25/03	Hosp2	12/6/02	1/1/00	Х	CGH	0	157.92	
5	South	5/23/03	Hosp3	10/20/02	1/1/00	Х	MAH	0	90.73	
6	North	7/15/03	Hosp1	5/7/03	1/1/00	Х	HEH	0	4103.78	

- 3. From the QI Macros menu, choose PivotTable Wizard.
- 4. The wizard will determine the best way to organize your data into a PivotTable and create one for you.

	A	В		С	D	E	F	G	н	I
1	Region	(All)	-							
3	Sum of DENIED CHARGES	ENT	-							
4	ADM DATE 👻	Hosp1		Hosp2	Hosp3	Hosp4	Hosp5	Hosp6	Hosp7	Grand Total
5	3/28/00				387.48					387.48
6	4/25/00				379.62					379.62
7	3/13/01				6908.98					6908.98
8	7/24/01			311.16					_	311.16
47	2/13/03	543	.07					[Ľ.	543.07
48	4/15/03								215	215
49	5/7/03	4103	.78							4103.78
50	6/2/03					12				12
51	8/8/03							482		482
52	Grand Total	18492	.75	32955.38	23447.35	4387.83	5416.62	5007	215	89921.93

4. Use Ctrl key to select labels and data in PivotTable to draw charts using the QI Macros.

Run a Macro Using the Menus

1. Input your Data into an Excel Worksheet: The simplest format for your data is usually one column and one row of labels, and one or more columns of data (e.g., samples).

D	ate/Lab ↓	els						
	А	В	С	D	E	F		
	Sample							
1	Number	Obs 1	Obs 2	Obs 3	Obs 4	Obs 5	←	Defects/Samples
2	S1	74.030	74.002	74.019	73.992	74.008		
3	S2	73.995	73.992	74.001	74.011	74.004		
4	S3	73.988	74.024	74.021	74.005	74.002		
5	S4	74.002	73.996	73.993	74.015	74.009		
6	S5	73.992	74.007	74.015	73.989	74.014		

Tip: Only select one column and row of labels. Each chart requires a certain # of columns of data to run properly:

Required number of columns of data:										
1	2	2 or more								
Pareto	XmR	Scatter	Box & Whisker							
Pie, Run	Histogram		Multi Vari							
c, np, XmR	Freq Hist									
Levey Jennings	EWMA	u Chart	XbarR							
Moving Avg	Cusum	p Chart	XbarS							
Dot Plot	XmedianR	Hotelling	Matrix Plot							

- 2. Select Your Data: Use your mouse to click-and-drag to select the data you want to graph. (Hint: don't select the whole column or row, just the cells you want to graph.)
- **3.** Select Your Chart: Click on the QI Macros menu and select the Chart Wizard or the chart you want to run.
- **4. Answer the Prompts:** Most charts will prompt you for titles and other information to complete the chart.
- **5. Review and Save Your Workbook:** When the macro is done you will have a workbook with 3 sheets: your data, the chart and an intermediate spreadsheet where you can view the calculations. Don't forget to save your workbook.

Data Format & Selection Tips

1. To highlight cells from different columns (as shown): Click on the top left cell and drag the mouse down to include the cells in the first row or column. Then, hold down the Control (Ctrl) Key, while clicking and highlighting the additional rows or columns.

	A	В	С	D
1		Plant 1	Plant 2	Plant 3
2	Jan	15	77	44
3	Feb	23	56	33
4	Mar	56	33	55
5	Apr	33	33	22
6	May	77	23	66
7	Jun	33	15	11
8	Jul	14	14	77

2. You may also use data in horizontal rows: Click on the top left cell and drag the mouse down and right to include the cells in the horizontal rows.

	A	В	С	D	E	F	G	Н
1		Jan	Feb	Mar	Apr	May	Jun	Jul
2	Plant 1	15	23	56	33	77	33	14
3	Plant 2	77	56	33	33	23	15	14
4	Plant 3	44	33	55	22	66	11	77

3. Numeric data and decimal precision: Excel formats most numbers as "General", not "Number." If you do not specify the format for your data, Excel will choose one for you. To get the desired precision, select your data, choose Format-Cells-Number and specify the number of decimals:

ormat Cell	s				
Number	Alignment	Font	Border	Fill	Protection
<u>C</u> ategory: General Number		Samp	le		

Common Error Messages

Many charts require more than one column of data. If you only select one column of data and then select one of these charts, you will receive the following error message:



The u chart assumes that your defects column is to the left of your sample size column. If the columns are reversed (larger #s on the left), the macros will ask you if the left column is the sample size.



Formatting Excel Charts

Once you create a chart, you can use any of Excel's menus and commands to enhance or format your chart. Just select the item to format and then right click to view the options available.

Add text boxes, arrows or other: Use Excel's drawing tools to add text boxes, arrows or other symbols to your chart. Drawing tools are under the Insert tab in Excel 2007-2013, or on the drawing toolbar in older versions of Excel.

```
Draw • 😓 | AutoShapes • 🔨 🔪 🖸 🔿 🛅 🐗 💱 💁 🖉 • 💆 • 💆 • 🗮 🛱 🖬 🗊 💂
```

Put two charts on the same worksheet: Click on your chart and select Edit-Copy. Next, click in the destination worksheet and select Edit-Paste.

For Other Chart Options: Right click on the item you want to change or click on the Chart Tools menu. For further information see: **qimacros.com/free-excel-tips/format-charts**



Pareto Chart

 Highlight the labels and one column (or more) of data (you will get a separate pareto for each data column): labels in the left-hand column, data in the right-hand column.

Pareto charts are a
combination line chart
and bar graph. They
help narrow your focus
to simplify problem
solving.

	A	В	С	D
1		Med Errors Baseline	Med Errors 6 months	Med Errors 18 months
2	Drug not available	3	5	4
3	Extra Dose	1	3	2
4	Omission	0	2	0
5	Unauthoried Drug	0	2	1
6	Wrong Dose	5	1	2
7	Wrong Form	3	0	0
8	Wrong Route	5	1	0
9	Wrong Technique	41	25	5
10	Wrong Time	33	13	16

2. From the QI Macros Menu, select Pareto Chart. If you have more than 9 data points, the macros will ask you how many bars you want before you summarize the miscellaneous ones into an "Other" bar. Input the number of bars and then click "OK."



Sample Pareto chart with an "Other" Bar.



If you want to continually add data, consider using the Pareto Chart template. Watch video of a pareto chart being created at: **qimacros.com/quality-tools/pareto-chart-video**

Scatter Chart



1. Highlight the labels and data to be graphed.

Scatter charts can help confirm your suspicions about cause and effects.

Scatter charts require two columns of data.

If $R^2 > .8$, most statistics books imply there is a strong correlation.

А	В
Cases (x)	Time (y)
7	16.68
3	11.50
3	12.03
4	14.88
6	13.75
7	18.11
2	8.00
7	17.83
5	21.50
10	21.00

2. From the QI Macros Menu, select "Scatter Diagram."

 The macro will create a scatter diagram with y and R² metrics. Other metrics can be found on the scatter data worksheet.



Watch video of a scatter plot being created at:

qimacros.com/training/videos/scatter-plot

Matrix Plot

You can also use a Matrix Plot to evaluate the correlation and cause effect between two or more variables.

Foam		Scent		Color	
	6.3		5.3		4.8
	4.4		4.9		3.5
	3.9		5.3		4.8
	5.1		4.2		3.1
	5.6		5.1		5.5
	4.6		4.7		5.1
	4.8		4.8		4.8
	6.5		4.5		4.3
	8.7		4.3		3.9



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QI Macros

Box &Whisker



1. Highlight the labels and data to be graphed.

	Cavity 1	Cavity 2	Cavity 3	Cavity 4
Тор	0.2522	0.2501	0.2510	0.2489
Middle	0.2523	0.2497	0.2507	0.2481
Bottom	0.2518	0.2501	0.2516	0.2485
Top	0.2514	0.2501	0.2508	0.2485
Middle	0.2513	0.2494	0.2495	0.2478
Bottom	0.2505	0.2495	0.2507	0.2484
Тор	0.2518	0.2498	0.2516	0.2494
Middle	0.2512	0.2484	0.2496	0.2485
Bottom	0.2501	0.2492	0.2507	0.2492
Тор	0.2520	0.2499	0.2503	0.2483
Middle	0.2514	0.2495	0.2501	0.2482
Bottom	0.2513	0.2501	0.2504	0.2491
Тор	0.2524	0.2488	0.2511	0.249
Middle	0.2518	0.2486	0.2504	0.2479
Bottom	0.2512	0.2497	0.2503	0.2488
Тор	0.2517	0.2496	0.2503	0.2485
Middle	0.2509	0.2487	0.2497	0.2483
Bottom	0.2513	0.2500	0.2492	0.2495

Box and Whisker plots help show the dispersion of data over time. Each bar is like a histogram turned on its side.

This chart requires 2 or more columns of data.

2. From the QI Macros Menu, select Box & Whisker. The macro will ask if your data is grouped in rows or columns. The data above has 18 rows and 4 columns. Watch video at: qimacros.com/training/videos/box-whisker-plot/

Graph if selected by rows







Multi Vari Chart

The Multi Vari Chart summarizes data based on labels (A:C) and plots the averages and data points. Watch video at: **qimacros.com** /**training/videos/multi-vari-chart**/ _{Overall Satisfaction}

	A	В	С	D
1	Size of Customer	Product Type	Customer Type	Overall Satisfaction
2	Small	Consumer	2	3.54
3	Large	Consumer	3	3.16
4	Small	Manufacturer	2	2.42
5	Large	Manufacturer	2	2.7
6	Small	Consumer	3	3.31
7	Large	Consumer	2	4.12



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QI Macros



Histogram

- 1. Make sure the cells are formatted to the correct decimal precision. Right click on cells and select Format-Cells, select Number and specify the number of decimal places you want.
- Highlight the labels and data to be graphed (a minimum of 20 data points is recommended). Click on the top data cell and drag the mouse down to include just the data cells. Tip: Do NOT sort your data before running a histogram.

A	В	С	D	E	F
Sample					
Number	Obs 1	Obs 2	Obs 3	Obs 4	Obs 5
S1	74.030	74.002	74.019	73.992	74.008
S2	73.995	73.992	74.001	74.011	74.004
S3	73.988	74.024	74.021	74.005	74.002

3. From the QI Macros Menu, select Histograms and Capability, then the Histogram you want. You will be prompted for upper and lower spec limits and the approximate # of bars. Click OK to use the defaults or enter your own. For one-sided or unilateral histograms, click Cancel if there is no USL or USL.

there is no USL or LSL.



4. Single Column of Data? If you select a single column of data, the histogram will prompt for subgroup size. Input subgroup size or use the default of 1 if there are none.

	A	В	С	D	E	F
1	Data1	C L	- C:			
2	74.030	Subgrou	o Size		_	
3	74.002					
4	74.019	Sub	aroun	Sizo?		
5	73.992		gioup	UILC :		
6	74.008					
7	73.995					
8	73.992	1				
9	74.001					
10	74.011			OK		el
11	74.004	1				





6. To move the USL or LSL arrows or text boxes:

Arrows: Click on each arrow and drag it to the appropriate position. To extend an arrow, click on it, then click on the handle at either end and extend the arrow.

Text: Click on each text box and drag it to sit on top or beside its corresponding arrow.

7. To revise the process capability analysis, switch to the Histdata sheet and change the upper and/or lower <u>specification</u> limits. Excel will recalculate **Cp**, **Cpk** and other metrics and update the contents of the text boxes on the chart. You can also change the **# of bars, class width and beginning point.**

LSL	73.970
USL	74.030
Number of Bars	11.000
Number of Classes	6.000
Class Width	0.010
Beginning Point	73.960

For information about histogram calculations in the QI Macros, see: **qimacros.com/pdf/histogram-manual-calcs.pdf**

Watch video of a histogram being created using the QI Macros at: **qimacros.com/training/videos/histograms**

c, np, p, and u Control Charts

Attribute control charts track the number of defects in a sample.

1. Highlight the labels and data to be graphed (as shown).c or np chartsp chartsu charts

	E	A	В	С		А	В	С
1	No. Pinholes	Sample	Nonconforming	Sample		Sample	Nonconforming	Sample
2	8	Number	Units	Size		Number	Units	Size
3	9	S1	12	100	•	S1	12	100
4	5	S2	8	80		S2	8	80
4	5	S3	6	80		S3	6	80
5	8	S4	9	100		S4	9	100
6	5	S5	13	110		S5	13	110
7	9	S6	12	110		S6	12	110
8	9	S7	11	100		S7	11	100
9	11	S8	16	100		S8	16	100
10	8	S9	10	90		S9	10	90

2. From the Control Charts Menu, select "c, np, p or u chart". The np chart will prompt for a sample size if you did not include it in your selection.



See also: qimacros.com/control-chart/show-hide-sigmalines and qimacros.com/control-chart/p-and-u-chartformats

$\frac{\overline{A}}{\overline{A}}$ X and R Control Charts

An <u>X chart</u> shows process performance using <u>continuous</u> <u>data</u> (i.e., time, length, weight, money, etc.)

1. Highlight the labels and data to be graphed. You will need 20 or more data points to get a good graph. Your data should look like this:

XmR	
-----	--

XbarR and XbarS

	А	В		Α	В	С	D	Е	F
	Batch			Sample					
1	Number	Viscosity	1	Number	Obs 1	Obs 2	Obs 3	Obs 4	Obs 5
2	B1	33.75	2	S1	74.030	74.002	74.019	73.992	74.008
3	B2	33.05	3	S2	73.995	73.992	74.001	74.011	74.004
4	B3	34.00	4	S3	73.988	74.024	74.021	74.005	74.002
5	B4	33.81	5	S4	74.002	73.996	73.993	74.015	74.009
6	B5	33.46	6	S5	73.992	74.007	74.015	73.989	74.014

- 2. From the QI Macros Menu, select "XmR, XmR Median R, XmR Trend, XbarR, XbarS, or Xmedian Chart." The macro will create a new worksheet and begin calculating the X and R values, control limits, and averages.
- **3.** The macro will first draw the Range Chart. If the R chart looks unstable, then the process is unstable.



4. Next, the macro will draw the X chart. If the Range Chart looks stable and the X chart is stable, then the process is stable.



5. From the File Menu, select Save to save the graph with your workbook.

Create Stair Step Limits

Before you run any control chart you can **insert a blank row** in your data where you know a process change occurred, the QI Macros will calculate separate UCLs and LCLs for each group of data giving you "stair-step" control limits.



For more information about control chart menu features see: qimacros.com/free-resources/excel-tips/#menu

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QI Macros

Control Chart Stability Rules

When you run a control chart, the QI Macros will show unstable points as diamonds and unstable trends in red. They will also show the Center Line, UCL and LCL for evaluating stability. The QI Macros use stability rules defined in Montgomery's Introduction to Statistical Quality Control 4th edition.

You can Show/Hide 1-2 sigma lines, change stability rules, or p/u chart limit formats (flat vs. wavy) as follows:

Control Charts Rules

1. Click on the QI Macros Menu, then Control Charts then Control Chart Rules. Show/Hide 1 & 2 Sigma Lines One Point Outside UCL/LCL Only Montgomery (Default) Rules Juran Rules AIAG Rules Westgard Rules Western Electric Rules Healthcare-IHT Rules Show Current Rules p/u UCL/LCL Format

2. Click on the stability rules you want to use. The stability rules for each selection are:

Control Chart Rules	Westgard	Nelson- Juran	AIAG	Montgomery	Western Electric	Healthcare
Points above UCL or Below LCL	1	1	1	1	1	1
Zone A n of n + 1 points above/below 2 sigma	2	2	2	2	2	2
Zone B n of n + 1 points above/below 1 sigma		4	4	4	4	
n points in a row above or below center line	8	9	7	8	8	8
Trends of <i>n</i> points in a row increasing or decreasing	7	6	6	6		6
Zone C - n points in a row inside Zone C (hugging)		15	15	15		15
n points in a row alternating up and down		14	14	14		
Zone C - n points in a row outside Zone C		8	8	8		
Zone Bin points above/below 1sigma: 2 points one above, one below 2sigma	4				_	

3. To hide sigma lines or change p/u chart formats, click on the appropriate selection.

4. Any changes you make will be saved to the QI Macros and will be applied to all of the charts you run. To change the rules back, simply click on Control Chart Rules and select Default rules or Show/Hide 1-2 sigma lines or p/u chart format. If you want to customize the stability and chart format rules even further, see: qimacros.com/free-excel-tips/control-chart-rules

QI Macros Chart Menu

After you run a chart, the QI Macros gives you additional tools to update and analyze your chart. To access these tools, click on a chart and then click on the QI Macros Chart menu.

Chart Menu in Excel 2007 - 2013

FILE	HOM	INSER	PAGE	FORM	DATA	REVIE	VIEW	DEVEL	ADD-I	QI Ma	DESIGN	FORMAT	QIMacros Char	t	
Add Data Show Process Analyze Stability						Clear Stability Analysis Recalculate UCL/LCL					Remember Format				
Add Targe	et Line to	o Chart	Ghost Point Analyze Stability Green Up					Up	Show/Hi	de Rule	Numbers	Convert S	t Skyline to Wave Apply Format		
Add Text	dd Text to Point Delete Point Analyze Stability Green Down			Down	Show/Hide 1-2 Sigma Lines Convert Wave to Skylin					Apply To All					
Ch	Chart Tools Control Chart Tools								Chart Format Tools						

Chart Menu in Excel 2003 and Mac versions of Excel

Add Data to Control Charts Recalculate UCL/LCL Add Target Line to Chart Show/Hide 1-2 Sigma Lines Add Tot to Point Convert Skyline to Wave Ghost Point from Control Chart Convert Skyline to Wave Delete Point from Control Chart Remember Chart Format Analyze Stability With Control Chart Apply Chart Format Analyze Stability (Green Down) Fill-in-the-Banks Templates About the QI Macros About the QI Macros	Þ

Add Data to Charts: Click on the chart datasheet (i.e. cdata) and input new data points. Then click on the chart. Next click on the QI Macros Chart menu and Add Data. Enter the number of rows to add and then click OK.

Input Number of Rows	×
How Many Rows of Data?	ОК
	Cancel
3	

Add Target Line to Chart: Click on the QI Macros Chart menu and then Add Target Line. You will be prompted for the series label (e.g. Target, Spec Limit, Goal, etc) and the value.

Analyze Stability: Always re-run stability analysis after you add new data, delete a point or show a process change on a control chart. To do so, simply click on Analyze Stability from the QI Macros Chart menu.

For more information on our new Control Chart Menu, visit: www.qimacros.com/control-chart/update-control-chart/ © 2014 Jay Arthur 21 QI Macros Delete Point: Deletes a point from a chart and the calculations.

Ghost Point: Deletes a point from the calculations, but leaves it on the chart.

Show Process Change: On the chart, click on the point where the process change occurred. Now click on the QI Macros Chart menu and select Show Process Change. The macros will calculate a new set of control limits, starting at the point you selected. The UCL, CL and LCL values will be updated to show the new limits. You can use this feature multiple times on the same chart.



Stability Analysis: Make sure you re-run stability analysis after you do any of these functions.

Show/Hide 1-2 Sigma Lines: Just click on this selection to add or delete 1-2 sigma lines from your chart.

Recalculate Control Limits After you Add New Data (optional): Control limits are calculated with the data you selected when running the macro. If you want to recalculate control limits after you add new data: Add new data to the chart. Next, click on the first data point on the chart and select Show Process change on the menu.

Since this function recalculates control limits using the point selected and every point to the right, it will recalculate your control limits using all of your data including the new points.

> For more information about all of these features, visit: qimacros.com/free-resources/excel-tips/#menu

Control Chart Dashboards

These new templates will automatically create Control Chart Dashboards for you.

1. Click on the QI Macros menu (see below examples) and select Control Chart dashboards. Then select the XmR, XbarR, or c, np, p, u Dashboard.



Excel 2007-2013



- 2. A template will open. Each template has an instructions sheet, a data input sheet, and a sheet for each available chart.
- 3. Input or cut and paste your data into the columns in the Data Sheet. Each column or set of columns creates a different chart. The XmR and XbarR dashboards have cells for USL/ LSL, as well.
- 4. Now click on the sheet for the desired chart. You will see a chart created from the first data set. Click on the previous and next arrows to view charts for each data set.
- **5.** If you want to create a dashboard with charts for all data sets, simply click on the Create Dashboards icon.
- 6. To add new data to the templates or the dashboard charts, just add data to the Data Sheet and click on the Refresh Data or Refresh Data with Stability Analysis icon.



See also:

qimacros.com/control-chart/control-chart-dashboard

Excel Charts

Excel's chart wizard enables you to run various charts. We have taken the most popular of these and made them easier to use. To run a these charts using the QI Macros:

- **1.** Highlight the labels and data to be graphed.
- 2. Click on the QI Macros menu, Excel Charts, then the chart you want to run.



Run Charts

A run chart is a line graph of your data plus a center line representing the average or median of your data. To create a run chart using the QI Macros:

- 1. Highlight the labels and data to be graphed.
- 2. Click on the QI Macros menu, then Run Charts.
- 3. Next choose between Average or Median.



Lean Six Sigma Templates

The QI Macros contain 90 + templates including flowcharts, fishbones, balanced scorecard, FMEA, QFD, DOE, GageR&R, PPAP, Value Stream Mapping, Time Tracking, and more. There are also templates for most charts including control charts, histograms, scatter, box and whisker plots, and pareto charts.

Templates for Lean Six Sigma in Excel 2007-2013: Click on QI Macros, then look for Templates for Lean Six Sigma. Click on each sub menu to get a list of templates in that category.

Lean Tools 🔻	Improvement Tools -				
Diagrams 🔻	DOE GageR&R FMEA 🔻				
Calculators -	Planning & PM Tools -				
Templates for Lean Six Sigma					

Templates Location in Older Versions of Excel: From the QI Macros Menu, choose Fill-in-the-Blanks Templates. Then choose a sub menu to get a list of templates in that category.

Fill-in-the-Blanks Templates	►	F	Planning Tools	•	
Data Transformation	►	I	mprovement Tools	۲	
Valuable Free Training Now		F	lowCharts and Fishbones	۲	
Free Tech Support Online		5	SPC Charts	۲	
Help		(DFSS, DOE & MSA	۲	
About the OI Macros		L	ean Tools.	۲	
		(GageR&R, PPAP, FMEA	۲	
		F	PM Tools	۲	

Many templates including the Balanced Scorecard, FMEA, Gage R&R, DOE, and PPAP Forms are really several different templates (worksheets) in one workbook. To access each worksheet, just click on the worksheet tab.

GAGER&R MSA 4th / Type 1 GRR / Range Method / Bias / Linearity / Attribute Gage

Our E-zine archives contain articles about many of these tools at: **qimacros.com/free-resources/six-sigma-articles**

Control Chart Templates



Use the Control Chart Templates to create various control charts.

1. Click on the QI Macros Menu, find "Control Chart Templates," and select the desired template.



2. Each template is made up of several worksheets (average, median, rolling, fixed, short run etc.) See further info and descriptions at: **qimacros.com/control-chart/control-chart-template**

\ XmR Individuals Chart / XmR Rolling / XmR MedianR / XmR Short Run / XmR Horizontal / XmR Fixed /

3. Input your data in the yellow area and the points will be plotted on the chart as you enter them. You can also cut and paste into the yellow area or link the cells to another spreadsheet.

Add New Data: when adding new data to your chart, the QI Macros will automatically update to the additional number of rows.

Delete a Point: simply delete the point from the input area.

Show Process Change: enter the Excel row number corresponding to the data point where the process change occurred in the Process Change at Row box to the right of the chart.

Process Change At Row 12

Analyze Stability: click on the chart and then select Analyze Stability on the QI Macros Chart menu.

For more information on our new Control Chart Menu, visit: www.qimacros.com/control-chart/update-control-chart

Ishikawa Fishbone Diagram

Use our Ishikawa or Fishbone Diagram (a.k.a. cause and effect diagram) to identify the special root causes of delay, waste, rework or cost.

1. Point to the Ishikawa / Diagram on the QI Macros Menu, on your Excel Toolbar. Improvement Tools





 Fill in the Blanks - Select the fishbone style (Cell F10) you want and then input your text in the yellow shaded cells. When you are done, click "Create Fishbone":



3. Analyze and Improve - QI Macros will automatically create a fishbone diagram for you.





Value Stream Mapping

The QI Macros includes several Lean Tools, including Flowcharts and Value Stream Maps.

- To create a Value Stream Map, select Fill-in-the-Blanks Templates, Lean Tools, then Value Stream Mapping.
- 2. The Value Stream Mapping template has several different tabs including a resource tab with Symbols, three different Value Stream Maps to help you get started and a Spaghetti Diagram.



3. Once you open a template, use the Symbols tab, Excel's cut and paste functions and Excel's drawing toolbar to create your Value Stream Map.



Gage R&R

 From the QI Macros, select Fill-in-the-Blanks Templates, then DOE, GageR&R, FMEA. Then choose the Gage R & R template.

	A	В	С	D	E	F	G	н	1	J	К	L	м	N	0
1	Gage R&R						Part Nu	ımber							
2	Average & Range	lethod	1	2	3	4	5	6	7	8	9	10	Sum		
3	Appraiser 1	Trial 1	0.29	-0.56	1.34	0.47	-0.8	0.02	0.59	-0.31	2.26	-1.36	5.710		
4	Enter your data here->	Trial2	0.41	-0.68	1.17	0.5	-0.92	-0.11	0.75	-0.2	1.99	-1.25			
5		Trial3	0.64	-0.58	1.27	0.64	-0.84	-0.21	0.66	-0.17	2.01	-1.31	2.110		
6		Trial4												Xbar1	Reference
7		Trial 5												0.190333	0.001
8		Total	1.34	-1.82	3.78	1.61	-2.56	-0.3	2	-0.68	6.26	-3.92			Bias
9		Average	0.44667	-0.607	1.26	0.5367	-0.853	-0.1	0.6667	-0.227	2.0867	-1.307		Rbar1	0.189
10		Range1	0.35	0.12	0.17	0.17	0.12	0.23	0.16	0.14	0.27	0.11		0.184	
11	Appraiser 2	Trial 1	0.08	-0.47	1.19	0.01	-0.56	-0.2	0.47	-0.63	1.8	-1.68	2.050		
12	Enter your data here->	Trial2	0.25	-1.22	0.94	1.03	-1.2	0.22	0.55	0.08	2.12	-1.62			
13		Trial3	0.07	-0.68	1.34	0.2	-1.28	0.06	0.83	-0.34	2.19	-1.5	0.890		
14		Trial4												Xbar2	Reference
15		Trial 5												0.068333	0.001
16		Total	0.4	-2.37	3.47	1.24	-3.04	0.08	1.85	-0.89	6.11	-4.8			Bias
17		Average	0.13333	-0.79	1.1567	0.4133	-1.013	0.0267	0.6167	-0.297	2.0367	-1.6		Rbar2	0.067
18		Range2	0.18	0.75	0.4	1.02	0.72	0.42	0.36	0.71	0.39	0.18		0.513	
19	Appraiser	Trial 1	0.04	-1.38	0.88	0.14	-1.46	-0.29	0.02	-0.46	1.77	-1.49	-7.630		
20	Enter your data here->	Trial2	-0.11	-1.13	1.09	0.2	-1.07	-0.67	0.01	-0.56	1.45	-1.77			
21		Trial3	-0.15	-0.96	0.67	0.11	-1.45	-0.49	0.21	-0.49	1.87	-2.16	-2.840		
22		Trial4												Xbar3	Reference
23		Trial 5												-0.254333	0.001
24		Total	-0.22	-3.47	2.64	0.45	-3.98	-1.45	0.24	-1.51	5.09	-5.42			Bias
25		Average	-0.0733	-1.157	0.88	0.15	-1.327	-0.483	0.08	-0.503	1.6967	-1.807		Rbar3	-0.256
26		Range3	0.19	0.42	0.42	0.09	0.39	0.38	0.2	0.1	0.42	0.67		0.328	

- 2. From the File Menu, select Save As to store the template.
- **3.** To conduct a study you'll need: five to ten of the same part from one batch or lot (these must span the range or tolerance you are trying to measure), at least two appraisers and a minimum of two measurement trials, on each part, by each appraiser. If you have references or specification tolerances, enter them.
- 4. Evaluate GageR&R, graphs, and data to identify where to improve your measurement system.

Gage R&R System Acceptability

- % R&R<10% Gage System is Okay (Most variation caused by parts, not people or equipment)
- % R&R<30% May be acceptable based on importance of application and cost of gage or repair
- % R&R>30% Gage system needs improvement (People and equipment cause over 1/3 of variation)

See free articles at:

qimacros.com/gage-r-and-r-study/aiag-msa-gage-r-and-r

Design of Experiments (DOE)

DOE can help you shorten the time and effort required to discover the optimal conditions to produce Six Sigma quality in your product or service.

- 1. On the Fill-in-the-Blank Templates menu select DOE, GageR&R, FMEA, then Design of Experiments. Next, select the type of DOE template you want to use.
- 2. Input your factors and the low-high settings for each factor. In a two factor test it might be, Time: 30 minutes & 45 minutes and Temperature: 325 degrees and 375 degrees.

	Design	of Experiments			
_	Factor	Factor Name	Level 1 Low(-)	Level 2 High(+)	
2 ²	A	Time Enter	30	45	Two Factor Experiment
	в	Tempera Factors	325	375	
	AB	Time X Temperature			
2 ³	С	c [*] Here			Three Factor Experiment
	AC	Time X c			
	BC	Temperature X c			
	ABC	Time X Temperature X c			
24	D	d			Four Factor Experiment
	AD	Time X d			
	BD	Temperature X d			
	CD	c X d			
	ABD	Time X Temperature X d			
	ACD	Time X c X d			
	BCD	Temperature X c X d			
	ABCD	Time X Temperature X c 3	Xd		

3. Use the +/- values in the orthogonal array to guide your test of every combination. In a two factor test it would be: High ++ (45 min & 375 degrees), Low - - (30 min & 325 degrees), In between + - (45 min & 325 degrees) and - + (30 min & 375 degrees).



4. Input your results into the yellow input area and observe the interactions. See the DOE article at: qimacros. com/lean-six-sigma-articles/design-of-experiments

Statistical Tools

Six Sigma utilizes analysis tools like ANOVA, regression, f test, t tests, etc. The QI Macros Statistical tools are much easier to use than Excel's Data Analysis Toolpak. The QI Macros also mistake-proof data entry and interpret the results of many statistical tests for you (i.e. data is normal, accept or reject null hypothesis).

- 1. Select data for analysis. Some tools, like Anova, can take many columns. Others, like Regression, use two columns. A few only use one column. Data must be in columns for these tools to work. See: documents/qimacros/testdata/anova for examples of how your data should be organized.
- 2. From the QI Macros Menu, choose Statistical Tools. A number of different statistical tools will be displayed.
- 3. Select the appropriate statistical analysis, and click OK. If you aren't sure, choose the Stat Wizard. Answer any of the prompts (defaults are provided) and the QI Macros will perform the analysis you've requested.
- 4. The QI Macros output will also interpret the results for you. It will tell you to Reject or Accept the Null Hypothesis and whether the Means or Variances are the same or different.

Stat Wizard	Lean Tools *	Improvement Tools *				
Statistical Tools *	Diagrams *	DOE GageR&R FMEA •				
Descriptive St	ality Test					
ANOVA Sing	ANOVA Single Factor					
ANOVA Two	Factor with Rep	plication				
ANOVA Two	Factor Without	Replication				
F-test: Two-s	ample for varia	nce				
Levene's test	for variance					
Equivalence	ſest					
t-Test: one-s	ample					
t-Test: Paired	two-sample fo	or means				
t-Test: two-s	ample assuming	g equal variances				
t-Test: Two-s	ample assumin	ig unequal variances				
z-Test: Two-s	ample for mea	ns				
Chi-Squared						
Fishers Exact	Test (2X2)					
Box Cox						
Correlation						
Covariance						
Exponential S	moothing					
Moving Aver	- Moving Average					
1-2 Proportio	ins Test					
Rank and Per	centile					
Regression						

Learn More:

qimacros.com/hypothesis-test/statistics-wizard-excel

qimacros.com/hypothesis-test/hypothesis-testing-excel

Data Mining Tools

The QI Macros Data Transformation Tools help you analyze your data and reorganize it to run a chart.

PivotTable Wizard

The QI Macros PivotTable Wizard, makes it easier to run PivotTables. Just select up to 4 column headings and select the wizard. **qimacros.com/quality-tools/pivot-table-cross-tab**/

Count Words in a Table

Just select your data and the Word Count function will count the number of times a word or two word phrase appears in your data. **qimacros.com/quality-tools/word-count/**

Stack/Restack/Restacking

This function increases or decreases the number of columns your data is organized into. It can take one column of data and "stack" it into multiple columns or it can take multiple columns of data and restack it into one column. It can also convert 2 columns to 3, or 4 columns to 2, etc. **qimacros.com/quality-tools/restack**/

Paste Link/Paste Link Transpose

Excel will paste-link and paste-transpose but it doesn't do both at the same time. Use these functions to create dashboards by linking your data to a chart template. Update your data sheet and the template and chart are automatically updated.

qimacros.com/quality-tools/pastelink/

Box Cox Transformation

Box Cox Transformation multiplies the selected data by a transformation factor. The purpose is to transform non-normal data into data that is closer to normal.

qimacros.com/quality-tools/boxcox/

Installation Trouble Shooting

QI Macros Menu is not visible in Excel or qimacros.xla could not be found message. Excel has disabled the QI Macros files. To fix the issue, simply re-enable the file per these instructions:

Excel 2000 - 2003: In Excel, click on Help/About Microsoft Excel then click on Disabled items in the lower right corner. Enable any disabled QI Macros files.



Excel 2007: Click on the office icon in the upper left corner. Excel 2010 and 2013: Click on File.

Next select Excel Options, then Add-ins on the left. Click on the arrow next to Manage, and select Disabled Items. Click Go to see the disabled items. If the QI Macros are disabled, enable them. Now close and re-open Excel.

Excel Options		?×
Popular Formulas Proofing	View and manage M	icrosoft Office add-ins.
Save	Name	Location
Advanced	Active Application Add-ins	C:\ ibran\Analysis\ANALY
Customize	Snaglt Add-in	C:\agIt 8\SnagItOfficeAd
Add-Ins	Add-in: Analysis Tool	Pak
Trust Center Resources	Publisher: Microsoft Co Location: C:\Program F ANALYS32.XLI Description: Provides data	rporation iles\Microsoft Office\OFFICE12\Lit a analysis tools for statistical and e
	Manage: Disabled Items	<u><u> </u></u>
	COM Add-ins COM Add-ins Smart Tags XML Expansion Pa	Cks
	Disabled Items	

Other Common Questions

- How do I set up my data? See test data files loaded on you computer at: c:Documents\QIMacros\testdata
- **Run Time Error...** These messages usually mean there is a problem with your data. Either your header looks like data, your data looks like text or you have selected blank cells.
- To Uninstall the QI Macros: Delete the qimacros.xla file and the QIMacros2010menu.xlam file (Excel 2007-2013 only) in Excel's startup folder at:

C:\Program Files\Microsoft Office\Office(10,11,12,14)\XLStart Windows 7 PCs may use Program Files (x86).

Windows 8 and Excel 2013 is located at: C:\Program Files\Microsoft Office15\Root\Office15\XLStart

Technical Support

Most tech support questions are answered at: qimacros.com/support/qi-macros-tech-support

If you're still having problems e-mail your Excel file and problem to: support@qimacros.com. Include the version number and service pack of Excel, and QI Macros version.

You can also call our tech support line at: (888) 468-1537 on Monday through Friday, from 8:00 am to 5:00 pm Mountain time.

QI Macros questions are free; however, there is an additional fee for SPC and Excel coaching and help.

If you get Windows or Excel errors, check the Microsoft knowledge base at support.microsoft.com

Other Resources

Free Training at: qimacros.com/free-resources/qi-macros-training **Email qimacros@aweber.com** for a FREE supplemental course on the QI Macros.

Free Webinars and Training

Free 1 Hour Webinars: Great overview of the key functions in the QI Macros at: qimacros.com/training/qi-macros-webinar/

Lean Six Sigma "Yellow Belt" Training: lssyb.com

Free email lesson series and monthly tips and tricks news-letter. Sign up by sending an e-mail to: qimacros@aweber.com

Free articles and tips and tricks archive at:

qimacros.com/free-resources/excel-tips/

Free QI Macros Video Tour at:

qimacros.com/qi-macros/video-tour/

Other Products and Services

We offer books, training videos and on-site training on:

Lean Six Sigma SPC

Download a product brochure at: qimacros.com/pdf/qiflyer.pdf

See on-site training options at: **qimacros.com/training/leansix-sigma-training**

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Tech Support: (888) 468-1537 or (303) 756-9144 or support@qimacros.com

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Refer to qimacros.com/support/qi-macros-faqs for more information.