



Inspection & Gage R&R Excel Pack

Start here: what each sheet does, how to run a Gage R&R study, and how to read the results.

One Excel workbook with five working sheets for the measurement and inspection side of a small shop's quality system. No macros, no add-ins. Every formula is visible, so you can show an auditor or customer exactly how a number was calculated.

What's inside

Sheet	What it does
Start Here	How to use the workbook
Gage R&R	Crossed study, 10 parts x 3 operators x 3 trials, average and range method. Calculates averages, ranges, the range control limit (and flags any range above it), EV, AV, GRR, PV, TV, % of total variation, % of tolerance, and ndc. Gives an ACCEPTABLE / CONDITIONAL / NOT ACCEPTABLE call.
Inspection Log	500-row receiving and in-process log. Accept / reject calculates from rejected quantity and cert check. Flags a reject with no NCR number, a sample larger than the lot, and a missing gage ID. Summary shows lots, rejects, and reject rate.
Dim Report	Dimensional inspection report, 60 characteristics x 5 pieces. Enter nominal and tolerances; limits, per-row PASS / FAIL, out-of-tolerance highlighting, and an overall ACCEPT / REJECT calculate. Handles go/no-go (attribute) checks too.
Cp-Cpk	Up to 100 readings. Calculates Cp and Cpk from within variation (moving range) and Pp and Ppk from overall standard deviation, with a capability call and a run chart.
Constants	K1, K2, K3, D4, d2, the 6-sigma study multiplier, and the ndc factor, in plain view.

Running a Gage R&R study

1. **Pick 10 parts** that cover the real spread of your process. Ten parts from one good batch make the gage look worse than it is, because there is little part variation to compare against.
2. **Hide the part numbers** from the operators and measure in a different random order each trial.
3. **Use 3 operators** who normally use the gage. Each measures every part 3 times without seeing earlier readings.
4. **Record full resolution.** Do not round. The gage should read to about a tenth of the tolerance.
5. **Type the readings** into the white cells. Check for any red range cells: those readings fell outside the range control limit. Find out why (misread, dirt, wrong part) and re-measure before trusting the result.
6. **Read the result.** Use %tolerance for gages that accept or reject parts, and %GRR (of total variation) for gages used to control the process.

%GRR	Call	What to do
Under 10%	ACCEPTABLE	Use the gage.
10% to 30%	CONDITIONAL	May be fine, depending on how important the feature is, the cost of a better gage, and the cost of getting it wrong. Get customer agreement for key characteristics.
Over 30%	NOT ACCEPTABLE	Improve the measurement system. If EV (repeatability) is the bigger part, look at the gage, fixture, and part holding. If AV (reproducibility) is bigger, look at how operators use the gage, and train to one method.

ndc (number of distinct categories) should be 5 or more. These bands are the common guideline from the AIAG *Measurement Systems Analysis* reference manual. Your customer's limits win if they differ. This workbook covers the average and range method only; if your customer requires the ANOVA method, use software that supports it.

How the formulas were checked

Before release, every Gage R&R and Cp/Cpk result in this workbook was recalculated in a spreadsheet engine and compared with a separate calculation written from scratch. Three datasets were used: one built so every answer can be worked out by hand; the example data that ships in the workbook; and the widely published reference example for this method. All results matched to the precision shown, and the reference example matched its published results (%GRR 26.7%, ndc 5) within rounding.

About the author

Built by Matt Norman, US Navy veteran and former SpaceX Falcon 9 quality inspector and QA supervisor. (Not affiliated with or endorsed by SpaceX.) It contains no SpaceX or customer proprietary information. The example parts and suppliers are made up.

Also from Norman Quality Tools

The Calibration Program Kit covers the gage register, recall, and out-of-tolerance side. For the whole AS9100 system, the AS9100 Audit-Prep Kit: payhip.com/b/vGoN8. Also: AS9102 FAI Kit · 8D & Root Cause Analysis Kit · Supplier Audit & Approval Kit.

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