

Risk matrices & RMR

Risk matrix in version 6

For the purpose of statistical analysis, version 6 provided the risk matrix according to VDA specifications as S/O matrix with the three colors red, yellow, and green plus the additional grey¹. Similar to all the other statistical analyses, further analysis schemes for the “risk matrix” analysis could be created.

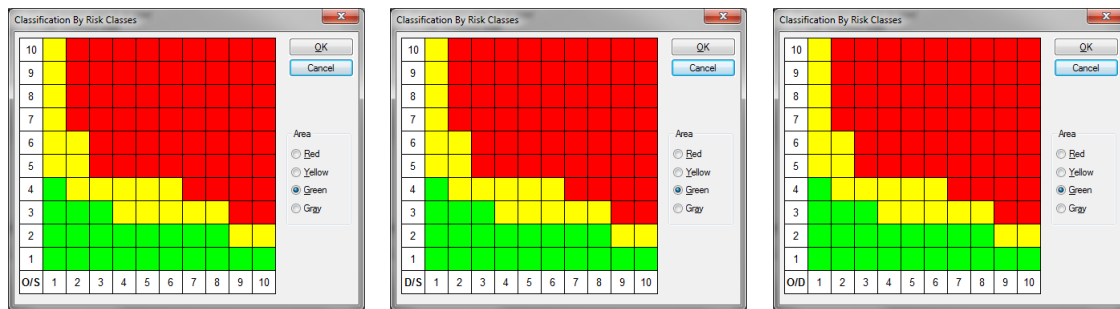


Figure: Three risk matrices in version 6 – O/S, D/S, and O/D

In Version 6, the required matrix can be selected and the definition of colors for the cells in the matrix can be changed of course.

Risk matrix and RPR – “traffic light factor” and Risk Matrix Ranking (RMR)

FMEA experts have more and more stressed the importance of the risk matrix in comparison to the risk priority ranking. Eventually there was a discussion, initiated by Mr. Werdich (co. Werdich Engineering), saying that the categorization in the three possible risk matrices in combination is better suited for a criterion of classification and processing sequence. The general topic of this discussion was “traffic light factor”.

APIS has pursued this discussion and now realized a feature that covers exactly this approach. The user can create any number of risk matrix sets, similar to valuation catalogs, and in addition sort the possible 27 combinations of the three colors of the different risk matrices in an ordered sequence. This sequence is called the Risk Matrix Ranking (RMR).

The risk matrix sets are managed via the Data Manager and can be saved in the file Normal.FMT as usual for risk matrices.

¹The special color “grey” for risk matrices is not available in version 6.5. The number of possible classes can thus be limited to 27. If a fourth color was used, 64 RMR classes would be possible.

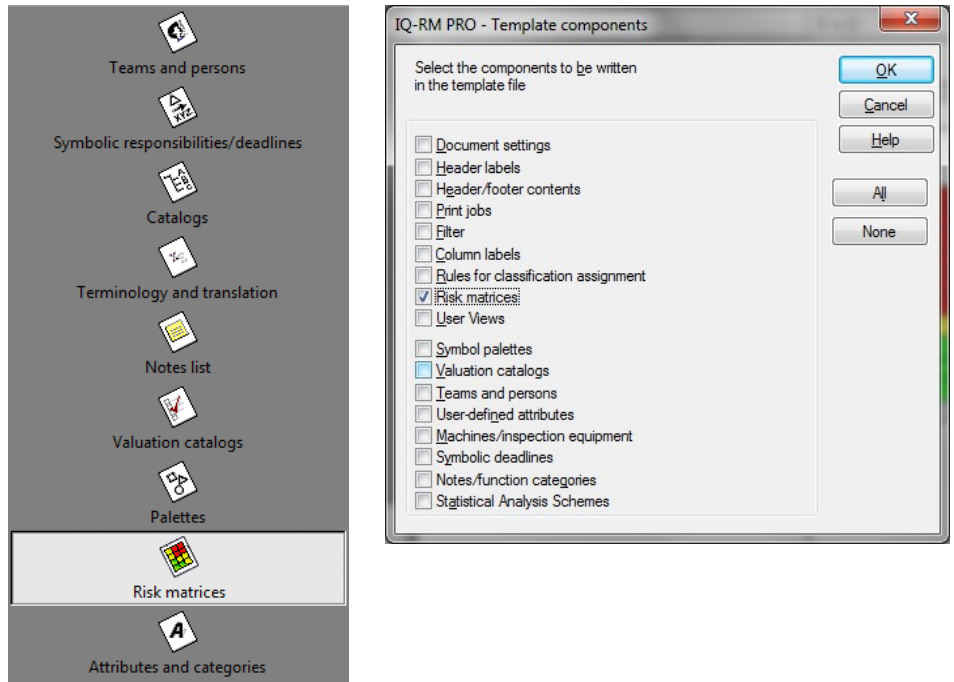


Figure: Data Manager and risk matrix management – dialog to save administration files in Normal.FMT

One of the traffic light colors can be assigned to each of the RMR classes. In theory, the assignment of more colors or numerical values to the individual classes is possible, but this would be contradictory to the claim of a simple representation of results and further handling.

The APIS IQ software is supplied with a risk matrix set as shown in the following:

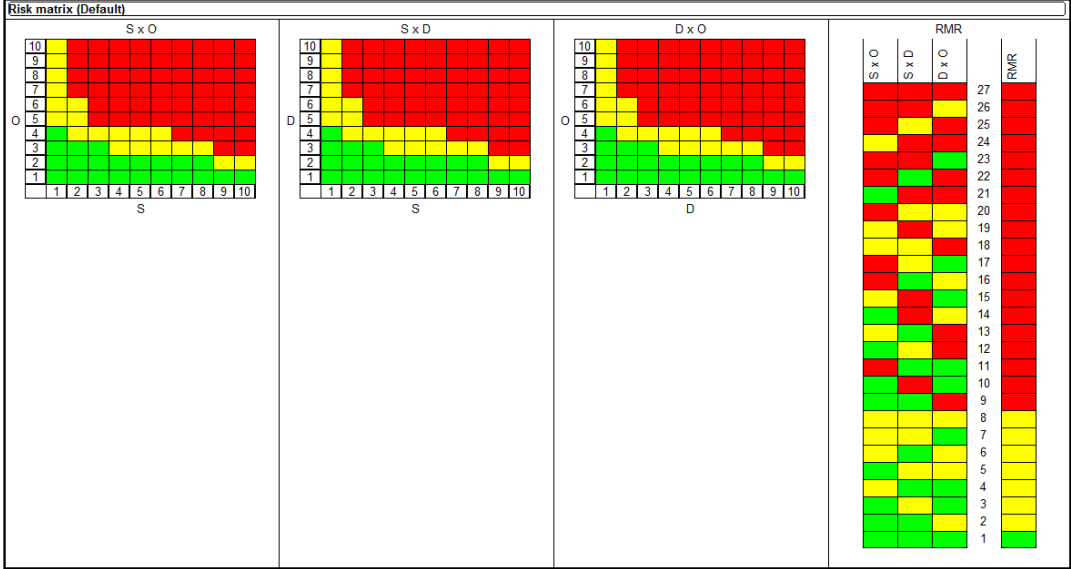


Figure: Risk matrix set “Standard” in V6.5 with RMR

A risk matrix set consists of the three risk matrices SxO, SxD, DxO and a section for the Risk Matrix Ranking (RMR). You can manage several risk matrix sets and assign them to individual projects, structures, structure variants, or FMEA forms.

The background color of the cells can be adjusted for each risk matrix in a risk matrix set in the same way as in version 6. It is additionally possible to rank the 27 possible color combinations in the RMR section. As a result, one of the three traffic light colors is again assigned to each combination as RMR.

The user has the possibility of customization according to his/her needs. It is e.g. possible to render the cells of a matrix in a risk matrix set entirely in the classification “green” to identify this matrix as irrelevant in the respective risk matrix set.

Examples of the standard risk matrix set as supplied:

Example 1:

S= 8, O = 5, D = 5, i.e. SxO = RED, SxD = RED, and OxD = RED, i.e. RMR = 27 = RED

Example 2:

S = 7, O = 4, D = 3, i.e. SxO = RED, SxD = YELLOW, and OxD = YELLOW, i.e. RMR = 20 = RED

Display in FMEA form

In version 6, a background color can be shown in the S, O, D, and RPN cells of the FMEA form. The background color is defined via the menu item “Parameters for color coding”.

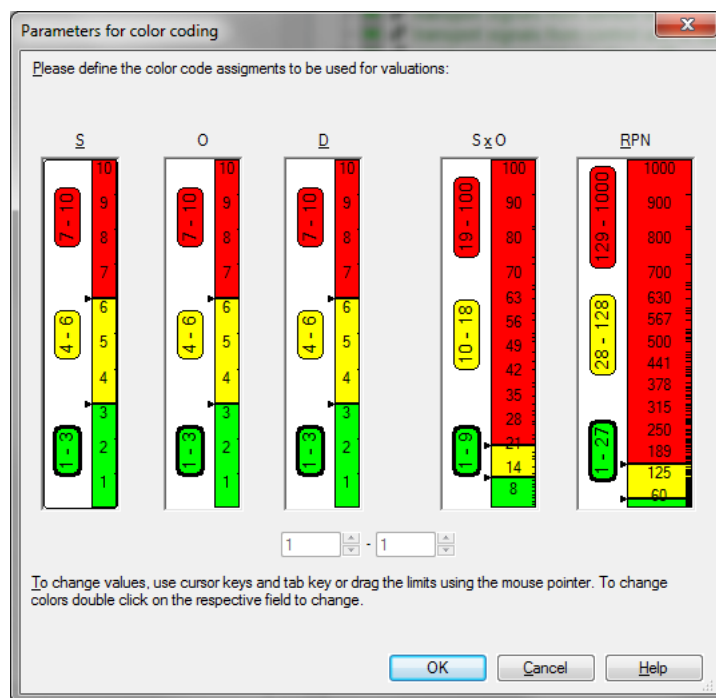


Figure: Dialog “Parameters for color coding”

The list of requested features for version 6.5 documented the request to use the color of the risk matrix in the FMEA form; this request was implemented. Up to four additional columns can be integrated in the FMEA form showing the colors of the risk matrix set.

| Effects | S | C | Failure mode | Cause | Preventive action | O | Detection action | D | RPN | R/D |
|---|---|---|---|---|------------------------------------|---|------------------|----|-----|-----|
| System element: Signal cable (complete) | | | | | | | | | | |
| Function: meet specifications for electromagnetic radiation | | | | | | | | | | |
| does not comply with requirements regarding electromagnetic radiation | 9 | | electromagnetic radiation exceeds specified limit | specified signal level drops significantly below critical limit | Initial state: 05.03.2009 keine | 1 | keine | 1 | 9 | |
| No further revision planned | | | | | | | | | | |
| Function: allow manual assembly | | | | | | | | | | |
| does not comply with customer requirements regarding assembly force | 5 | | special tools for assembly required | required force is too high | Initial state: 05.03.2009 NONE | 4 | NONE | 10 | 200 | |

| Effects | S | C | Failure mode | Cause | Preventive action | O | Detection action | D | RPN | R/D |
|---|---|---|---|---|-----------------------------------|---|------------------|----|-----|-----|
| System element: Signal cable (complete) | | | | | | | | | | |
| Function: meet specifications for electromagnetic radiation | | | | | | | | | | |
| does not comply with requirements regarding electromagnetic radiation | 9 | | electromagnetic radiation exceeds specified limit | specified signal level drops significantly below critical limit | Initial state: 05.03.2009 NONE | 1 | NONE | 1 | 9 | |
| Function: allow manual assembly | | | | | | | | | | |
| does not comply with customer requirements regarding assembly force | 5 | | special tools for assembly required | required force is too high | Initial state: 05.03.2009 NONE | 4 | NONE | 10 | 200 | |

| Effects | S | C | Failure mode | Cause | Preventive action | BxA | O | Detection action | BxE | D | ExA | RPN | RMR | R/D |
|---|---|---|---|---|-----------------------------------|-----|---|------------------|------|---|-----|-----|-----|-----|
| System element: Signal cable (complete) | | | | | | | | | | | | | | |
| Function: meet specifications for electromagnetic radiation | | | | | | | | | | | | | | |
| does not comply with requirements regarding electromagnetic radiation | 9 | | electromagnetic radiation exceeds specified limit | specified signal level drops significantly below critical limit | Initial state: 05.03.2009 NONE | | | 1 | NONE | 1 | | 9 | | |
| Function: allow manual assembly | | | | | | | | | | | | | | |
| does not comply with customer requirements regarding assembly force | 5 | | special tools for assembly required | required force is too high | Initial state: 05.03.2009 NONE | | | 4 | NONE | | | 10 | 200 | |

Figure: FMEA form – 1. Without colors, 2. With “colors for ratings” (color coding), 3. With columns for risk matrix rankings

The options “colors for ratings” and “columns for risk matrix rankings” as shown above can be combined. The figure shows an example, in which the colors match, even though such a concordance is not always given.

Use of Risk Matrix Ranking (RMR)

If a sorted list of all 27 possible classes is to be compiled or the Risk Matrix Ranking (RMR) is to be illustrated, then it is convenient to use it as a factor in the Pareto analysis.

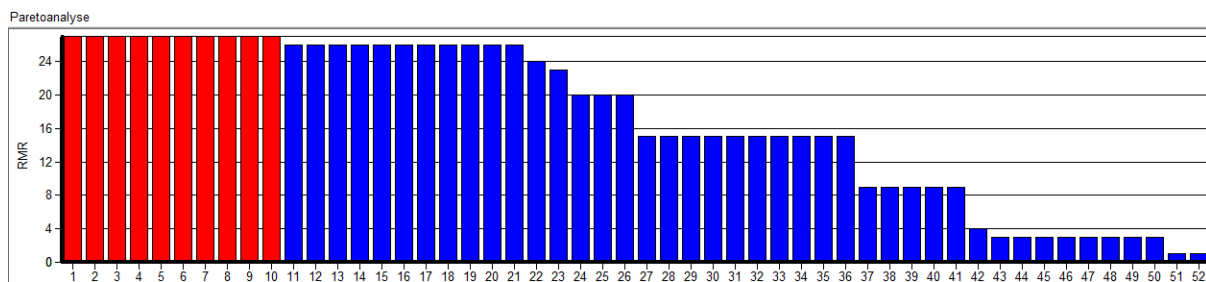


Figure: Pareto analysis based on the RMR

The RMR color can also be used for filters.

- Risk matrix (RMR) equals Red
- Risk matrix (SxD) equals Red
- Risk matrix (SxO) equals Red
- Risk matrix (DxO) equals Red

Figure: Filter criteria RMR, SxD, SxO, and DxO