Hints for Design Expert Usage

Optimality Search

The default criteria for obtaining D- or I-optimal designs leads to rather short searches and does not take into account that computer time should be commensurate with the time spent for developing a DOE. It does not make sense to spend hours or days in developing a DOE and then have it generated in 0.1 s with the possible consequence of a sub-optimal design. You can always stop the design generation process to obtain the best design obtained so far.

Recommended Settings:

Edit / Preferences / Math Preferences / Optimal Build:

Random Starts	10.000 to 50.000
Lack of Fit tries	1000 (usually not applicable)
Number of threads	4 (max)
Start distance	1
Stop distance	0.002
Max loops	(not applicable)
Run until convergence	Yes
Excursion size	10

Power Options

The default alpha value for power is 0.05. Empirically the default model selection criterion AICc will lead to the inclusion of effects with p-values of ≈ 0.05 to 0.1. Therefore, it is recommended to set the alpha value for power to 0.1.

Recommended Settings:

Edit / Preferences / Math Preferences / Math Analysis: Power significance threshold = 0.1

Default Design

The recommended "default" design can be found at:

Standard Designs / Response Surface / Randomized / Optimal (Custom)

or in case of Hard-to-change factors:

Standard Designs / Response Surface / Split-Plot / Optimal (Custom)

This is irrespective if a screening or optimization design is sought. In case of a screening (optimization) design we would choose Optimality: D (I) in the second screen.

Recommended "Runs" settings:

Additional model points[1]	3 (screening) or 5 (optimization)
Lack-of-fit points[2]	0
Replicate points[3]	0
Additional center points[4]	3

1) Additional runs should generally be added as additional model points as these are the ones improving the model the most. The number can be reduced by 1 if center points are requested. Center point replicates only add one degree of freedom to the lack of fit and therefore only count as one independent run.
2) Lack of fit points should only be used when a factor has more than 3 levels and not all of them have been included in the design with the standard settings.
3) Replicate points specify the desired minimal number of replicates, which are not center points. It is generally better to use independent runs instead of replicating. Irrespective of the settings here, Design Expert will include replicates if it improves the design.
4) This only specifies the minimal number of center points. Design Expert might generate more center points than the number here if it is beneficial for the design. Center points can also be added subsequently through Design Tools / Augment Design / Add Center Points (Put Center Points in: Block 1).

Optimization

The setting for finding desired optimal conditions on a response surface can also be adjusted to provide a more thorough search.

Recommended settings:

Edit / Preferences / Math Preferences / Optimization:

Random starting points	10.000
Simplex fraction	0.01
Maximum number of solutions	1000

Confidence / Tolerance Intervals

Confidence or tolerance intervals can be added to XY-Graphs through:

Edit / Preferences / Graph Preferences / XY Graphs

Display confidence / tolerance bands

3D Wireframe

A great tool for comparing all runs with the prediction model is the 3D surface graph when the surface is changed to a wireframe:

Edit / Preferences / Graph Preferences / Surface Graphs

⇨ 3D graph shading: Wireframe
⇨ 3D graph resolution: Low

Other Settings

- Show coded factor values:
  Display Options / Process Factors / Coded
- Show design points:
  Display Options / Design Points / Show (+ select which ones)
- Remove Warnings from Graphs:
  Edit / Preferences / Graph Preferences / All Graphs / Show warnings on graph
- In case of program crashes when calculating design spaces (graphical optimization):
  Edit / Preferences / Graph Preferences / Surface Graphs / 2D graph resolution: Low
- Change the design model:
  Go to Design / Design Layout and then choose the menu Design Tools / Edit Design Menu