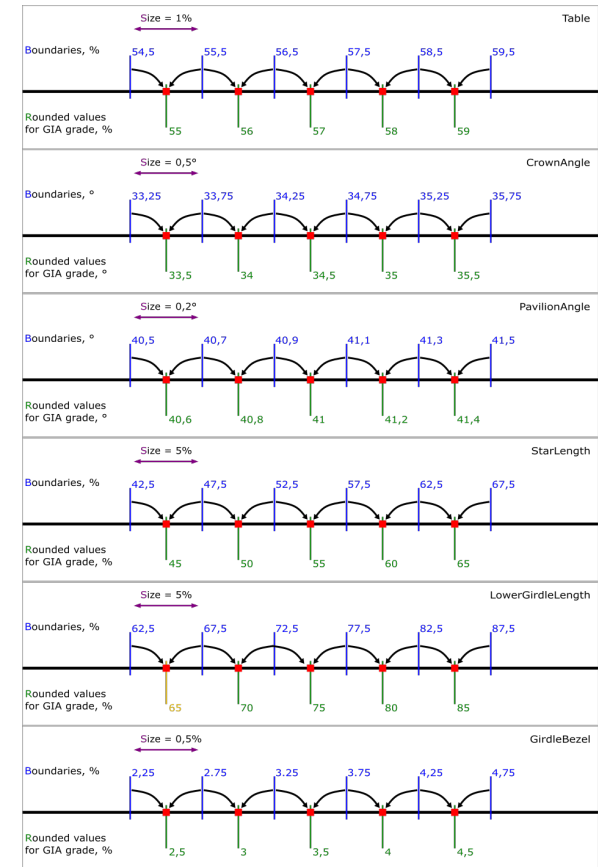
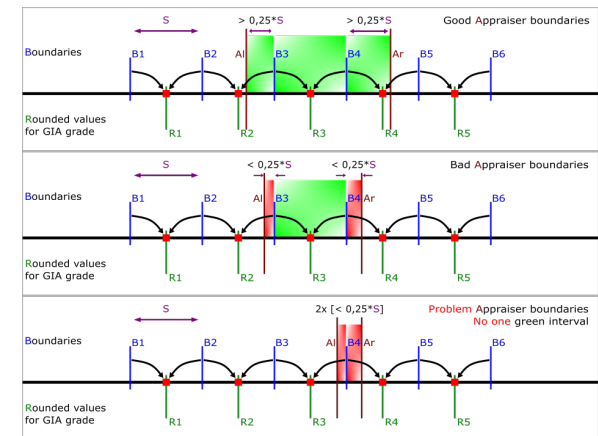


# Recommendations on Boundaries for main GIA parameters

## GIA Cut Grade Boundaries



## MyRound Boundaries



GIA Cut Grade is used during Brilliant Cut optimization with appraiser "GIA Facetware + MyRound". This grade is a complex nonconvex discrete function from 6 parameters: **Table**, **CrownAngle**, **PavilionAngle**, **StarLength**, **LowerGirdleLength**, **GirdleBezel**. The characteristics of this function create problem to use it in optimization algorithms. SmartRecut operates in 2 stages. At the first stage, a solution is sought in a large convex area of the parameters six-dimensional space. Most of the area is of user-defined quality. But there are also parts of the area with less quality. If the optimal by weight solution gets less quality during optimization, then algorithm goes to second stage. At the second stage, the nearest six-dimensional cell of user-defined quality is found and optimization does not go beyond its **Boundaries**.

The first figure shows for each of the 6 parameters: **Boundaries** of cells, **Size** of cells, centers of cells — **Rounded values for GIA grade** and rounding of average values to **Rounded values for GIA grade** is illustrated. The values for the figure were taken closer to the center of the EX zone. Exception: There is no EX-combination with LowerGirdleLength = 65.

Another problem with the GIA Cut Grade for optimization algorithms is that the GIA before rounding uses a peculiar way of parameters averaging instead of the usual mathematical averaging. SmartRecut can only use standard mathematical averaging. Therefore, SmartRecut cannot use the space close to the **Boundaries** between two 6D-cells, let's call it a **"dead zone"** (below there is detailed description of "dead zone"). Otherwise, SmartRecut may get user-defined quality, but the GIA will rate the diamond with a less quality due to peculiar averaging.

In addition to the GIA Cut Grade, users can set their own MyRound intervals for each of these parameters via Appraiser editor. And these boundaries can create problems for the SmartRecut algorithm.

GIA Facetware + MyRound									
Profile: MyProfile1									
Parameter	[ FR ]	[ GD ]	[ VG ]	[ EX ]	EX ]	VG ]	GD ]	FR ]	
Table	10	46,5	49,5	54	60	66,5	69,5	99	
CrownAngle	10	21,75	26,25	31,35	36,75	38,75	40,25	90	
PavilionAngle	10	38,7	39,7	40,5	41,9	42,5	43,1	90	
SweetLine	-9	-6	-3	-1,5	1,5	3	6	9	
StarLength	10	32,5	37,5	42,5	57,5	72,5	77,5	90	
LowerGirdleLength	50	57,5	62,5	75	82	92,5	97,5	99	
GirdleBezel	0	1,25	1,75	2,25	4,75	5,75	7,25	20	
GirdleValley	0	0	0,35	0,75	2,94	4,14	6,14	20	

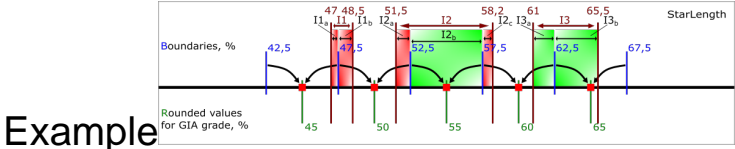
When setting boundaries, it is important to take into account not only **Rounded values for GIA grade** you want, but also "cells" **Boundaries**. We recommend setting the **Appraiser boundaries** for these parameters so that the distance from the left MyRound boundary (**Al**) to the nearest larger **Boundary** of the "cell" is more than  $(0,25 * \text{Size})$ . Similarly, the distance from the right MyRound boundary (**Ar**) to the nearest smaller **Boundary** of the "cell" was more than  $(0,25 * \text{Size})$ . See **"Good Appraiser boundaries"**. Let's call  $(0,25 * \text{Size})$  it a **"recommended cell size"**.

For most of the parameters, the **"dead zone"** is less than **"recommended cell size"**. But after subtraction of the **"dead zone"** size from **"recommended cell size"**, the optimization has a very small search area, therefore it is statistically more profitable to work in a farther green "cell", and ignore the red "cells". See **"Bad Appraiser boundaries"**.

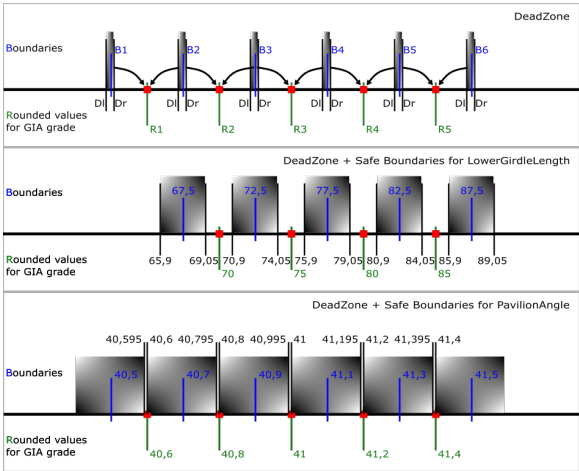
Even more bad situation for optimization when there are no green cells. See **"Problem Appraise boundaries"**. And there are enough one-parameter bad boundaries to make all 6D-cells are red. For example, LowerGirdleLength [77, 78.4] or narrower boundaries create this situation. At the time of Carbon 1.4.4, the second stage of SmartRecut does not correct the quality of the GIA Cut Grade in such situations. In the future, one of the red "cells" will be selected in such a situation, but this does not cancel the recommendation about **"recommended cell size"** =  $(0,25 * \text{Size})$ .

Let's take a look at **StarLength** as an example. For **StarLength** **"recommended cell size"** = 1.25%. There are 3 MyRound intervals in the figure

Interval **I1** = [47, 48.5] is **problem**. It contains two red cells **I1a** = [47, 47.5] of length 0.5% and **I1b** = [47.5, 48.5] of length 1%. Both are shorter than **"recommended cell size"** = 1.25%



## Dead Zone and Safe Boundaries



Interval **I2** = **[51.5, 58.2]** is **bad**. It contains two red cells **I2a** = **[51.5, 52.5]** of length 1% and **I2c** = **[57.5, 58.2]** of length 0.7%. And one full green cell **I2b** = **[52.5, 57.5]**.

Interval **I3** = **[61, 65.5]** is **good**. It contains two green cells **I3a** = **[61, 62.5]** of length 1.5% and **I3b** = **[62.5, 65.5]** of length 3%. Both are longer than "recommend ed cell size" = 1.25%. If you reduce **I3** to [61.3, 65.5] it becomes **bad**. If you reduce it to [61.3, 63.7] it becomes **problem**

The current sizes of the *dead zone* are shown in the table. If you set narrow limits on the parameter in MyGIA, you must take into account the *dead zone* size and not fall completely into it.

Parameter	$B_i - DI$	$Dr - B_i$
Table	0.1%	0.1 %
CrownAngle	0.0501 °	0.035 °
PavilionAngle	0.0501 °	0.035 °
StarLength	0.1001%	0.0501 %
LowerGirdleLength	0.1001%	0.0501 %
GirdleBezel	0.03%	0.015 %

It is important to understand that the "Safe Boundaries" option will increase the size of the *dead zone* by margin. Below are the sizes of the *dead zone* in Safe Boundaries mode.

Parameter	$B_i - DI$	$Dr - B_i$
Table	0.1% + 0.008 mm	0.1% + 0.008 mm
CrownAngle	0.0501 + 0.1 = 0.1501 °	0.035 + 0.1 = 0.135 °
PavilionAngle	0.0501 + 0.06 = <del>0.1101</del> 0.1 °	0.035 + 0.06 = 0.095 °
StarLength	0.1001 + 1.5 = 1.6001 %	0.0501 + 1.5 = 1.5501 %
LowerGirdleLength	0.1001 + 1.5 = 1.6001 %	0.0501 + 1.5 = 1.5501 %
GirdleBezel	0.03 + 0.1 = 0.13 %	0.015 + 0.1 = 0.115 %

For example, in "Safe Boundaries" mode, you cannot require LowerGirdleLength exactly 71 or 72,73,74,76,77,78,79. Of the round values, only multiples of 5 are allowed. Particular attention should be paid to the Pavilion Angle parameter. Its *dead zone* in "Safe Boundaries" mode occupies almost the entire space. Moreover, there is still a small chance that a GIA Cut grade error will be detected with margin = 0.06. For this parameter, Smart Recut can only technically guarantee safety when Margin < 0.049 (because of red equality in the table)

## Related Pages

[MyRound | GIA Facetware + MyRound](#)

[Smart Recut](#)