

Progressive Addition Lenses - Measurements and Ratings

Jim Sheedy, OD, PhD
Raymond F. Hardy, B.S
John R. Hayes, PhD

The Ohio State University
College of Optometry
Columbus, OH

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Table 1. Criteria for calculating ratings from measured values

Rating Category	Derivative Measures	0-100 scale
Distance Zone	50% - width at fitting cross	5-20 mm
	50% - area from 1.5 mm above fitting cross	15-60 mm ²
Intermediate Zone	50% - width at 1.25 D add	2-5 mm
	50% - area from 0.75 to 1.50 add	10-30 mm ²
Near Zone*	50% - width at Y	0-15 mm
	50% - area to Y +0.5 mm	0 - 100 mm ²
Astigmatism	Largest magnitude	2.75 - 1.25 D

* Near zone ratings reported for a specified fitting height. Fitting height determined by adding 2 mm to the Y value

Tables 3 and 4 rate the lenses along a single attribute related to the near viewing zone. You would use these tables ONLY for those patients for whom near vision is the single over-riding need. This would apply to patients who perform extensive near tasks yet also desire a general purpose PAL. This also applies to patients who intend to use the lenses primarily as reading glasses but also desire a general purpose PAL. An OPL should be considered for some of these patients.

Because the near characteristics are dependent upon the fitting height, ratings are presented separately for fitting heights of 16, 18, and 22. The rankings are directly related to the width and area of the near viewing zone. As result, the ratings generally increase with greater fitting height – because a greater fitting height necessarily results in a larger near viewing zone for all lenses. The larger ratings for greater fitting heights represent the fact that the patient will have a larger and wider near viewing zone with a greater fitting height. Only a few lenses provide any near addition for a fitting height of 16 mm. Note also that the rankings change somewhat as a function of the fitting height. This is because manner in which the near zone changes towards the bottom of the lens is different for the various lenses

Table 3. Ratings for near viewing zones - fitting heights of 16 and 18. Columns of dots indicate values that are not statistically different from one another. Highest and lowest rated designs, determined as explained in the text, are in **bold**.

Single Attribute Ratings															
Near Zone Rating															
Fitting Height 16						Fitting Height 18									
PAL Design	Mean	SD	Ranges of non-significant differences				PAL Design	Mean	SD	Ranges of non-significant differences					
Shamir Piccolo	33.7	2.1	•				Shamir Piccolo	50.1	2.5	•					
Sig Kod Concise	31.6	2.7	•				Sig Kod Concise	48.5	4.0	•	•				
Rdnstk Life XS	30.0	1.5	•	•			Sig Nav Short	48.2	10.0	•	•				
Varilux Ellipse	29.1	1.8	•	•			AO Compact	45.1	4.5	•	•	•			
AO Compact	29.0	3.4	•	•			Rdnstk Life XS	43.7	1.7	•	•	•	•		
Sig Nav Short	28.7	12.7	•	•			Varlx Ellipse	40.0	2.3	•	•	•	•		
Vis Ease Illumina	22.8	4.7	•	•			Vis Ease Illumina	38.3	3.6		•	•	•		
SolaMax	19.3	4.5		•	•		SolaMax	38.2	4.0		•	•	•	•	
AO Easy	18.4	4.4		•	•	•	SOLA One	34.8	3.8			•	•	•	•
Pentax AF Mini	18.1	7.2		•	•	•	Younger Image	32.7	4.9			•	•	•	•
SOLA One	17.7	4.1		•	•	•	AO Easy	32.5	3.2			•	•	•	•
Vis Ease Outlk	17.3	3.2		•	•	•	Vis Ease Outlk	32.3	3.1			•	•	•	•
Sig Kod Precise	16.7	4.0		•	•	•	Pentx AF Mini	31.9	4.1			•	•	•	•
Younger Image	16.1	6.9		•	•	•	Sig Kod Precise	31.5	2.8			•	•	•	•
Pentax AF	11.3	10.5			•	•	Sig Kodak	28.6	7.5				•	•	•
Varilux Comfort	10.1	6.9			•	•	Shamir Genesis	27.8	6.6					•	•
Varilux Liberty	10.0	7.2			•	•	Varlx Comfort	27.4	5.7					•	•
Rdnstk Life AT poly	8.8	6.1				•	Rdnstk Life AT poly	27.2	6.5					•	•
Shamir Genesis	8.6	5.1				•	Varlx Panamic	27.1	3.3					•	•
Varilux Panamic	8.3	6.0				•	Varlx Liberty	26.2	9.3					•	•
Sig Kodak	7.5	8.1				•	Pentx AF	23.5	15.2					•	•
ZeI Gradal Brevity	6.5	9.5				•	ZeI Gradal Brevity	17.3	15.9						•
ZeI Gradal Top	0.0	0.0				•	ZeI Gradal Top	15.3	8.5						•
Mean	17.4	11.0					Mean	33.3	11.5						

The ratings for astigmatism are directly related to the magnitude of the unwanted astigmatism. Lenses with higher ratings have less unwanted astigmatism and therefore fewer distortions in the field. Lenses with higher astigmatism ratings should be used for patients who are particularly sensitive to lens adaptation problems.

Table 4. Ratings for unwanted astigmatism and for near zone - fitting height of 22. Columns of dots indicate values that are not statistically different from one another. Highest and lowest rated designs, determined as explained in the text, are in **bold**.

Single Attribute Ratings																
Astigmatism rating					Rating Fit Height 22											
PAL Design	Mean	SD	Ranges of non-significant differences					PAL Design	Mean	SD	Ranges of non-significant differences					
Varlx Panamic	73.9	2.3	•					Shamir Piccolo	79.9	2.1	•					
AO Easy	67.9	2.5	•	•				AO Compact	72.7	6.5	•	•				
Zei Gradal Brevity	67.7	4.0	•	•				Sig Nav Short	70.7	6.6	•	•				
AO Compact	67.4	4.0	•	•				SolaMax	70.4	3.9	•	•				
SOLA One	66.6	3.1	•	•				Rdnstk Life XS	70.1	2.5	•	•	•			
Pentx AF Mini	64.2	4.4	•	•				Sig Kod Concise	68.0	6.8	•	•	•	•		
Vis Ease Illumina	64.0	7.6	•	•				Vis Ease Illumina	67.1	2.9	•	•	•	•		
Shamir Piccolo	57.9	2.1			•	•		SOLA One	61.7	5.6		•	•	•	•	
Sig Kod Precise	56.3	4.8				•		Younger Image	61.3	7.3		•	•	•	•	
SolaMax	56.1	2.8				•		Rdnstk Life AT poly	60.7	4.2		•	•	•	•	
Pentx AF	55.3	20.0				•	•	Sig Kod Precise	59.2	3.4		•	•	•	•	
Shamir Genesis	55.3	3.2				•	•	Varilux Ellipse	58.1	3.7			•	•	•	
Varlx Ellipse	54.6	4.5				•	•	AO Easy	57.8	6.0			•	•	•	
Younger Image	52.3	3.1				•	•	Varilux Comfort	56.7	8.5				•	•	•
Varlx Liberty	51.1	3.3				•	•	Vis Ease Outlk	55.8	5.7				•	•	•
Sig Kod Concise	51.0	3.5				•	•	Sig Kodak	55.7	8.6				•	•	•
Zei Gradal Top	47.5	2.7					•	Pentax AF Mini	55.7	4.7				•	•	•
Sig Kodak	46.9	3.1					•	Shamir Genesis	55.4	4.8				•	•	•
Rdnstk Life XS	46.6	3.2					•	Varilux Liberty	53.1	12.0				•	•	•
Sig Nav Short	46.3	10.9					•	Varilux Panamic	52.0	5.6				•	•	•
Vis Ease Outlk	43.5	2.4					•	Zei Gradal Top	43.8	8.5					•	•
Varlx Comfort	42.7	6.3					•	Pentax AF	42.7	23.3						•
Rdnstk Life AT poly	19.4	4.5						• Zei Gradal Brevity	32.7	28.8						•
Mean	54.5	12.8						Mean	59.2	14.0						

The ratings in Tables 5 and 6 are based upon equal weightings of the distance and intermediate ratings and the intermediate and near (fitting height of 22 mm) ratings respectively. The ratings on the left do not consider the amount of unwanted astigmatism, whereas those on the right hand side include a 25% weighting of astigmatism.

The distance/intermediate ratings in Table 5 apply to patients with primary visual needs at those 2 distances and for whom near viewing is not as important. This could apply to drivers or those with outdoor occupations and recreations who have intermediate viewing needs but for whom near viewing is not as important. The ratings that include astigmatism weighting apply to patients with sensitivity to unwanted astigmatism.

Table 5. Distance oriented visual usage, based upon combined ratings for distance and intermediate zones. Ratings with and without weighting for astigmatism rating. Columns of dots indicate values that are not statistically different from one another. Highest and lowest rated designs, determined as explained in the text, are in **bold**.

Distance and Intermediate Combined																					
Without Astigmatism					With Astigmatism																
PAL Design	Mean	SD	Ranges of non-significant differences																		
PAL Design	Mean	SD	Ranges of non-significant differences																		
Rdnstk Life AT poly	62.8	9.6	•								Shamir Genesis	60.2	4.5	•							
Shamir Genesis	61.9	6.3	•								ZeI Gradal Top	58.3	5.5	•							
ZeI Gradal Top	61.9	6.8	•								ZeI Gradal Brevity	56.4	13.5	•	•						
Younger Image	56.6	8.7	•	•							Younger Image	55.5	6.9	•	•						
Vis Ease Outlk	56.4	6.3	•	•							Vis Ease Outlk	53.2	4.8	•	•	•					
Sig Kodak	53.5	8.1	•	•	•						Rdnstk Life AT poly	52.0	7.1	•	•	•	•				
ZeI Gradal Brevity	52.7	17.4	•	•	•	•					Sig Kodak	51.9	6.2	•	•	•	•				
Pentax AF	50.3	24.8	•	•	•	•	•				Varilux Panamic	51.7	4.3	•	•	•	•				
Varilux Liberty	47.4	5.9	•	•	•	•	•	•			Pentax AF	51.6	15.3	•	•	•	•				
Varilux Panamic	44.3	5.9	•	•	•	•	•	•			Varilux Liberty	48.3	4.5	•	•	•	•				
Varilux Comfort	43.2	9.9	•	•	•	•	•	•			Sig Kod Precise	45.8	5.0		•	•	•				
Sig Kod Precise	42.3	6.2		•	•	•	•	•			AO Easy	45.5	2.7		•	•	•				
SolaMax	39.8	5.1			•	•	•	•			Pentax AF Mini	44.0	6.9		•	•	•	•			
AO Easy	38.1	3.3				•	•	•			SolaMax	43.8	3.6		•	•	•	•			
Pentax AF Mini	37.3	8.5				•	•	•	•		SOLA One	43.6	3.5		•	•	•	•			
SOLA One	36.0	4.2					•	•	•		Varilux Comfort	43.0	7.9			•	•	•			
Vis Ease Illumina	34.4	13.8					•	•	•		Vis Ease Illumina	41.8	8.7				•	•	•		
Rdnstk Life XS	26.6	8.7						•	•		AO Compact	34.8	6.3						•	•	
Shamir Piccolo	26.1	3.6							•		Shamir Piccolo	34.1	2.8							•	
AO Compact	24.0	7.5									•	Varilux Ellipse	31.7	3.3							•
Varilux Ellipse	24.0	3.5									•	Rdnstk Life XS	31.6	6.5							•
Sig Nav Short	23.9	15.5									•	Sig Kod Concise	30.5	5.2							•
Sig Kod Concise	23.7	6.3									•	Sig Nav Short	29.5	9.4							•
Mean	42.0	16.1									Mean	45.2	11.4								

The ratings in Table 7 combine the ratings for distance, intermediate and near viewing zones or the distance and near zones. These ratings apply for general usage needs. The ratings based upon all three zones apply for patients with general viewing needs at all 3 distances. The ratings that include astigmatism weighting apply to patients with sensitivity to unwanted astigmatism.

Table 7. General vision usage category, using combined ratings for distance, intermediate and near (FH 18) zones. Ratings with and without weighting for astigmatism rating. Columns of dots indicate values that are not statistically different from one another. Highest and lowest rated designs, determined as explained in the text, are in **bold**.

Distance, Intermediate and Near (FH 18) Combined																
Without Astigmatism					With Astigmatism											
PAL Design	Mean	SD	Ranges of non-significant differences					PAL Design	Mean	SD	Ranges of non-significant differences					
Rdnstk Life AT poly	50.9	5.7	•					Shamir Genesis	51.7	3.5	•					
Shamir Genesis	50.5	5.0	•					Younger Image	49.6	4.1	•	•				
Younger Image	48.6	5.0	•					ZeI Gradal Brevity	47.6	6.5	•	•	•			
Vis Ease Outlk	48.4	4.2	•					Varilux Panamic	47.4	2.5	•	•	•			
ZeI Gradal Top	46.4	3.3	•	•				Vis Ease Outlk	47.2	3.2	•	•	•			
Sig Kodak	45.2	4.1	•	•	•			ZeI Gradal Top	46.6	2.7	•	•	•			
Pentax AF	41.4	11.9	•	•	•			Sig Kodak	45.6	3.0	•	•	•			
ZeI Gradal Brevity	40.9	8.0	•	•	•			Pentax AF	44.9	6.1	•	•	•			
Varilux Liberty	40.3	3.5	•	•	•			AO Easy	44.2	1.7			•	•	•	
SolaMax	39.2	3.0		•	•	•		SolaMax	43.4	2.0			•	•	•	
Sig Kod Precise	38.7	4.0		•	•	•		SOLA One	43.3	2.0			•	•	•	
Varilux Panamic	38.6	3.5		•	•	•		Rdnstk Life AT poly	43.1	4.4			•	•	•	
Varilux Comfort	37.9	6.2			•	•	•	Sig Kod Precise	43.1	3.3			•	•	•	
AO Easy	36.2	2.0			•	•	•	•	Varilux Liberty	43.0	2.3			•	•	•
Vis Ease Illumina	35.7	8.2			•	•	•	•	Vis Ease Illumina	42.8	4.5			•	•	•
SOLA One	35.6	2.2			•	•	•	•	Pentax AF Mini	42.6	4.0			•	•	•
Pentax AF Mini	35.5	4.7			•	•	•	•	Shamir Piccolo	40.1	1.6			•	•	•
Shamir Piccolo	34.1	2.0			•	•	•	•	AO Compact	40.1	3.6			•	•	•
Rdnstk Life XS	32.3	5.6			•	•	•	•	Varilux Comfort	39.1	5.0					•
Sig Kod Concise	32.0	3.3			•	•	•	•	Sig Kod Concise	36.7	2.8					•
Sig Nav Short	32.0	7.2			•	•	•	•	Rdnstk Life XS	35.9	4.2					•
AO Compact	31.0	4.0			•	•	•	•	Sig Nav Short	35.6	3.6					•
Varilux Ellipse	29.3	2.5			•	•	•	•	Varilux Ellipse	35.6	2.6					•
Mean	39.2	8.1						Mean	43.0	5.6						

The ratings in Table 8 combine the ratings for distance and near viewing zones. These ratings apply for general usage needs for patients for whom the intermediate viewing zone is not particularly important. The ratings that include astigmatism weighting apply to patients with sensitivity to unwanted astigmatism.

Table 8. General vision usage category, using combined ratings for distance and near (FH 18) zones. Ratings with and without weighting for astigmatism rating. Columns of dots indicate values that are not statistically different from one another. Highest and lowest rated designs, determined as explained in the text, are in **bold**.

Distance and Near (FH18) Combined														
Without Astigmatism					With Astigmatism									
PAL Design	Mean	SD	Ranges of non-significant differences			PAL Design	Mean	SD	Ranges of non-significant differences					
Shamir Genesis	52.8	8.1	•			Shamir Genesis	53.4	5.7	•					
Vis Ease Outlk	51.5	7.1	•			Vis Ease Outlk	49.5	5.2	•	•				
Rdnstk Life AT poly	48.4	11.4	•			Younger Image	46.9	6.0		•	•			
Younger Image	45.1	8.3	•			Vis Ease Illumina	43.2	4.6			•	•		
Sig Kodak	37.2	6.4		•		Sig Kod Precise	41.7	4.9			•	•	•	
Sig Kod Precise	36.8	6.5		•		AO Compact	41.6	4.3			•	•	•	
ZeI Gradal Top	36.3	6.6		•		Rdnstk Life AT poly	41.1	9.1			•	•	•	
Vis Ease Illumina	36.3	8.0		•		Varilux Panamic	40.8	2.7			•	•	•	
Rdnstk Life XS	35.3	5.5		•	•	Sig Kodak	39.7	4.3				•	•	
Sig Kod Concise	34.5	4.4		•	•	AO Easy	39.3	2.2				•	•	
Varilux Comfort	33.2	7.9		•	•	ZeI Gradal Top	39.1	4.7				•	•	
AO Compact	33.1	5.3		•	•	Sig Kod Concise	38.6	3.5				•	•	
Varilux Ellipse	32.6	3.3		•	•	•	Shamir Piccolo	38.3	2.6				•	•
Shamir Piccolo	31.8	3.4		•	•	•	Varilux Ellipse	38.1	3.1				•	•
Sig Nav Short	31.8	5.2		•	•	•	Rdnstk Life XS	38.1	4.0				•	•
Varilux Liberty	30.5	8.7		•	•	•	SOLA One	36.5	1.9				•	•
Varilux Panamic	29.8	3.5		•	•	•	Varilux Liberty	35.7	5.9					•
AO Easy	29.8	3.4		•	•	•	Sig Nav Short	35.5	4.8					•
SolaMax	28.6	4.8		•	•	•	Varilux Comfort	35.5	5.7					•
SOLA One	26.5	2.9			•	•	SolaMax	35.4	3.3					•
ZeI Gradal Brevity	23.8	4.5				•	ZeI Gradal Brevity	34.7	3.1					•
Pentax AF Mini	13.6	7.9				•	Pentax AF Mini	26.3	6.1					•
Pentax AF	12.0	9.0				•	Pentax AF	22.9	9.0					•
Mean	33.5	11.6					Mean	38.8	7.9					

Fitting Heights Compared

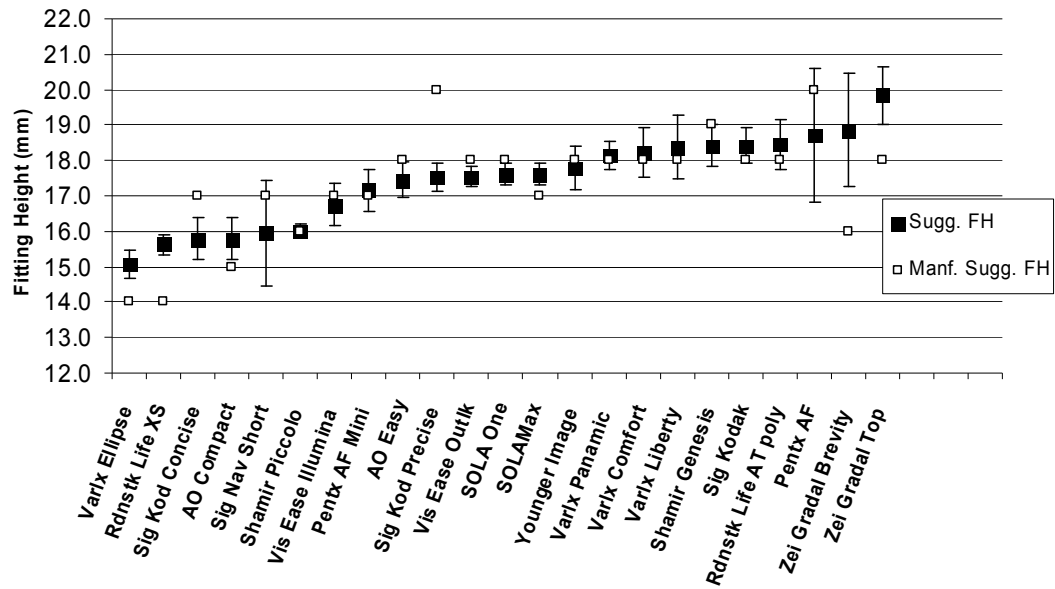


Figure 8. Minimum suggested fitting heights based upon the measurements (error bar is standard deviation) and as suggested by the manufacturer. The black box indicates the suggested minimum fitting height based upon independent study measurements.

Summary of best rated PAL designs by category.

	Lens design	Rating		Lens design	Rating
Best rating for distance vision	Shamir Genesis	77.8	Best rating for general vision - not considering astigmatism	Rdnstk Life AT	50.9
	Vis Ease Outlk	70.7		Shamir Genesis	50.5
	Rdnstk Life AT	67.5		Younger Image	48.6
	Younger Image	57.5		Vis Ease Outlk	48.4
	Zei Gradal Top	57.2		Zei Gradal Top	46.4
Best rating for near vision (FH 18)	Shamir Piccolo	50.1	Sig Kodak	45.2	
	Sig Kod Concise	48.5	Best rating for general vision - including astigmatism	Shamir Genesis	51.7
	Sig Nav Short	48.2		Younger Image	49.6
	AO Compact	45.1		Zei Gradal Brevity	47.6
	Rdnstk Life XS	43.7		Varilux Panamic	47.4
	Varlx Ellipse	40.0		Vis Ease Outlk	47.2
	Vis Ease Illumina	38.3			
SolaMax	38.2				
Best rating for unwanted astigmatism	Varlx Panamic	73.9	Shortest corridor lenses	Lens design	Min Fit ht
	AO Easy	67.9		Varlx Ellipse	15.1
	Zei Gradal Brevity	67.7		Rdnstk Life XS	15.6
	AO Compact	67.4		Sig Kod Concise	15.8
	SOLA One	66.6		AO Compact	15.8
	Pentx AF Mini	64.2		Sig Nav Short	16.0
	Vis Ease Illumina	64.0		Shamir Piccolo	16.0
				Vis Ease Illumina	16.8