

# The Lighting Designer Page

## Lighting Instruments: The ellipsoidal, the fresnel, the PAR

### Ellipsoidal Reflector Spotlight

The most common focusable unit used in the theatre today is the ellipsoidal reflector spotlight (ERS, or in theatrical slang, "leko"). The output of an ERS is a round (conical), well-defined beam of light. Ellipsoidal reflector spotlights come in a variety of beam spreads specified either by their actual beam spread in degrees, or by the lens diameter and the focal length of the lens. Specification by beam spread is relatively new to the industry so older units will most likely be specified by the latter method. A few commonly available ERSs are 5°, 10°, 20°, 30°, 40°, 50°, 4 1/2 x 6", 6 x 9, 6 x 12, 6 x 16, and 6 x 22. Because of the precise light control possible with the ERS, these units, assuming the appropriate beam spread is chosen, are effective from any position in the theatre.

Beam spread angles and multiplying factor (MF) for Altman ellipsoidals		
instrument model #	beam spread	multiplying factor
4.5 x 6.5	55°	1.03
6 x 9	37°	.68
6 x 12	26°	.48
6 x 16	19°	.34
6 x 22	11°	.18

**Ellipsoidal**  
also known as  
(ERS or Leko)

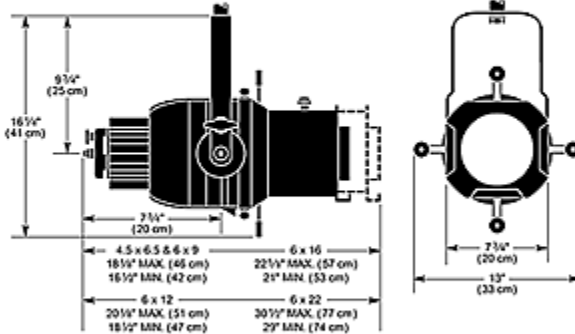
**Altman Ellipsoidal**

- 360 Q - 4.5 x 6.5
- 360 Q - 6 x 9
- 360 Q - 6 x 12
- 360 Q - 6 x 16
- 360 Q - 6 x 22

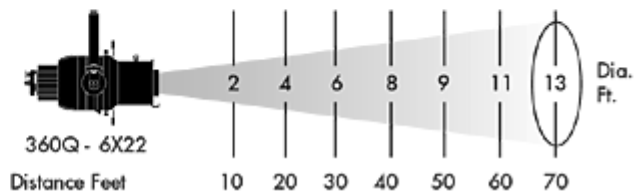
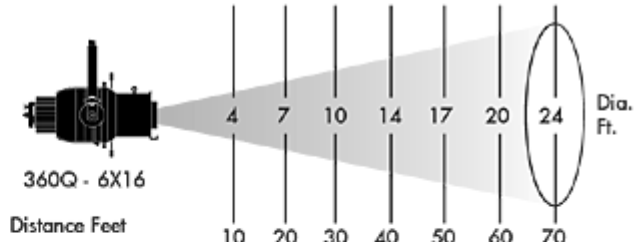
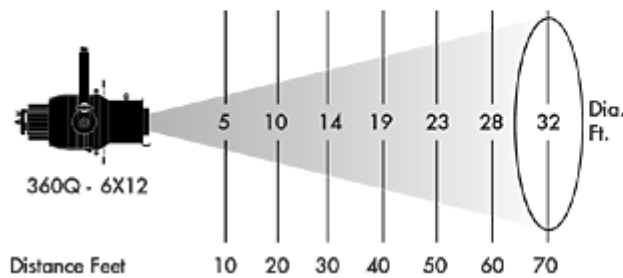
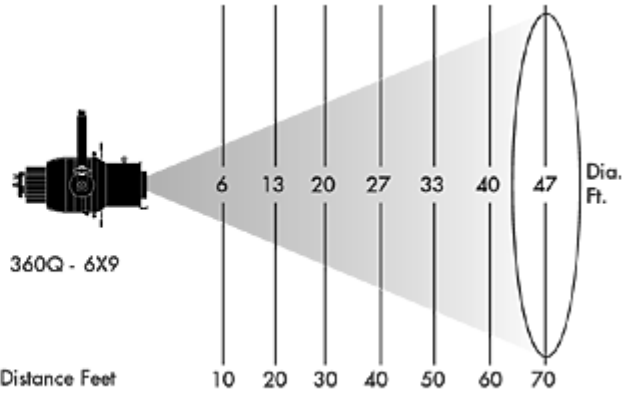
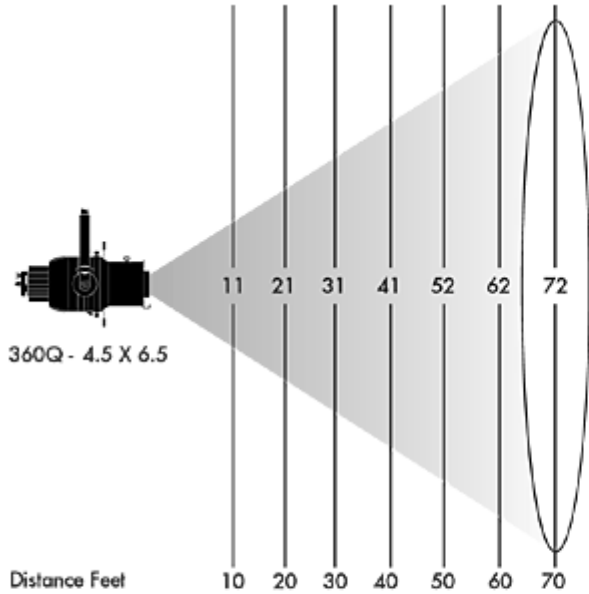
**Weight:** Approx; 13 1/2 lbs. (13.5 kg.) for 360Q 4.5 x 6.5.  
 Approx; 14 lbs. (6.3 kg.) for 360Q 6 x 9.  
 Approx; 15 lbs. (6.75 kg.) for 360Q 6 x 12,  
 6 x 16, & 6 x 22.



360 Q - 6 x 12  
(pictured)



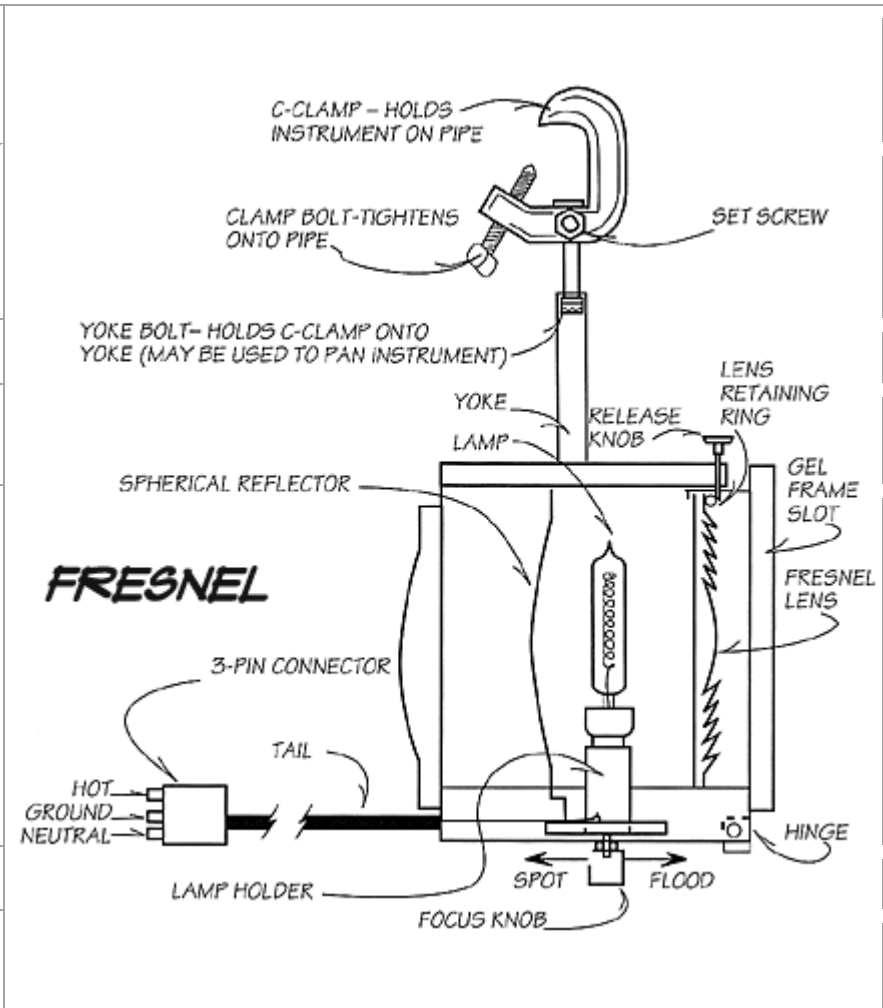
**Beam Spreads for Altman Ellipsoidals**



# The Fresnel

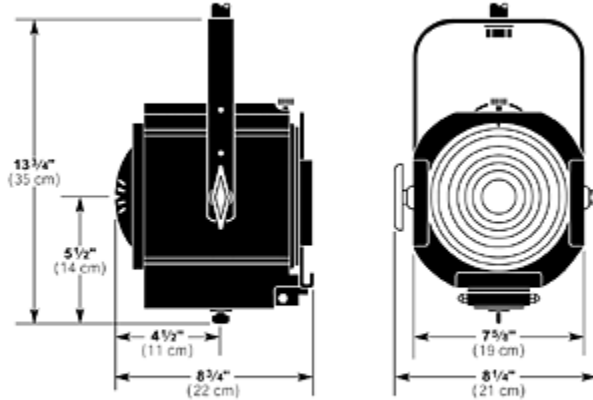
A lightweight, short throw, all purpose lighting device the 6" fresnel produces a soft edged beam which varies in diameter from 4.2 feet to 21 feet at a throw distance of 15 feet for the 65Q. The 65Q is designed for operation with a long life, high intensity tungsten halogen lamp. The Luminaire is used in theatre for acting area lighting where beam shaping is not required or in television studios for key and backlighting.

Beam spread angles and multiplying factor (MF) for Altman fresnels		
instrument #	field angle spread	multiplying factor
6" model # 65Q		
spot focus	16°	.28
flood focus	70°	1.40
8" fresnel		
instrument # 75Q	weight : approx .	
	18 lbs	
spot focus	12°	.32
flood focus	45°	.91



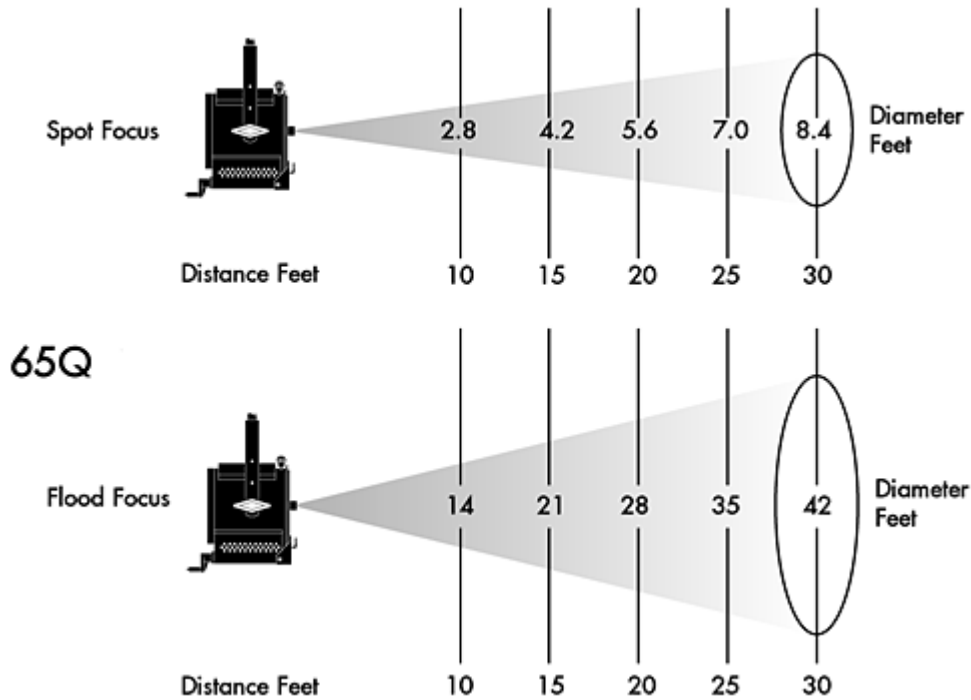


65Q Hanging Weight - approx. 8 lbs. (3.6 kg)



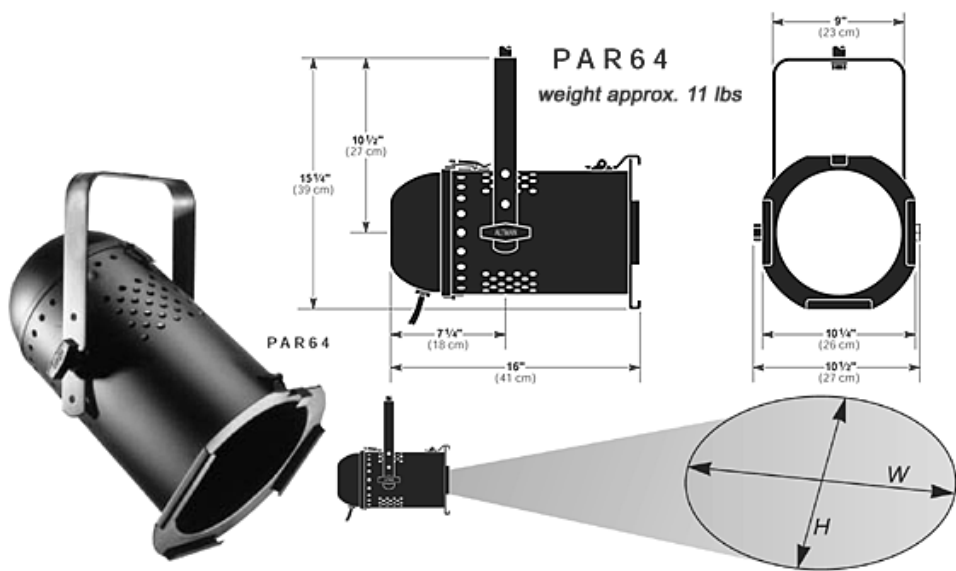
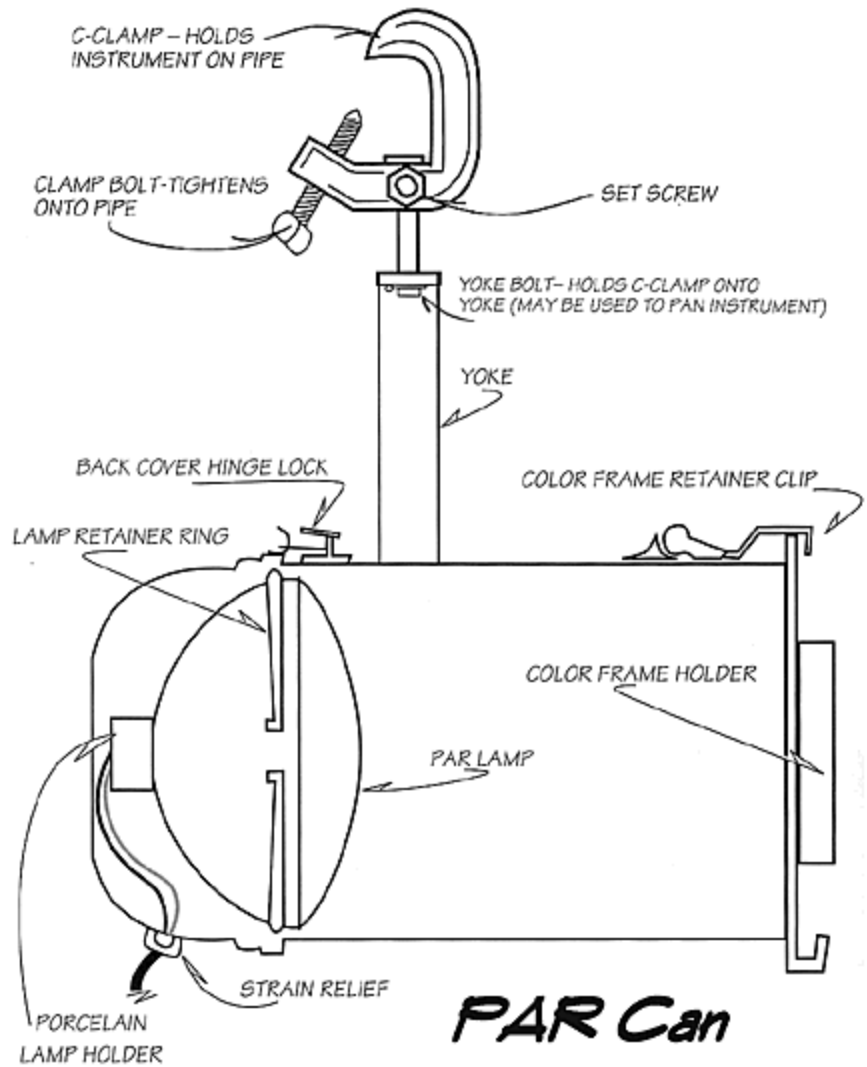
*Altman 6" Fresnel model 65Q*

### 6" Fresnel beam spread



## PAR

The PAR64 is a low cost, versatile luminaire designed for diverse applications. Intensities and beam spreads are a function of the lamp selected for use in the fixture. One unit can serve multiple purposes simply by changing the lamp. The PAR has an oval shaped beam and is usually lamped at 1000 watts.



## PAR64 Lamp Data

Watts	ANSI Code	Manufacturer Lamp Code	Color Temp (°K)	Rated Life (Hours)	Beam Lumens	Beam Shape	Candlepower (Candela)	Beam Angle (Degrees)	Field Angle (Degrees)
1000	-	Q1000 PAR 64/NSP Narrow	3000	4000	8,500	NSP narrow	180,000	8 x 15	14 x 31
1000	-	Q1000 PAR 64/MFL Medium	3000	4000	10,000	MFL medium	80,000	12 x 28	22 x 45
1000	-	Q1000 PAR 64/WFL Wide	3000	4000	13,500	WFL wide	33,000	24 x 48	45 x 72

### Par 64 Lamp Performance Chart

Distance	10'			20'			30'			40'			50'		
	Center Beam FC	H	W	Center Beam FC	H	W	Center Beam FC	H	W	Center Beam FC	H	W	Center Beam FC	H	W
1000 watt NSP-narrow	1800	2.5	5.5	450	4.9	11.1	200	7.4	16.6	113	9.8	22.8	72	12.3	27.7
1000 watt MFL-medium	800	3.9	8.3	200	7.8	16.6	89	11.7	24.9	50	15.6	33.1	32	19.4	41.4
1000 watt WFL-wide	330	8.3	14.5	83	16.6	29.1	37	24.9	43.6	21	33.1	58.1	13	41.4	72.7

# Calculation reference for beam spreads

The Beam Angle is the angle between the two directions opposed to each other over the beam axis for which the luminous intensity is half that of the maximum luminous intensity.

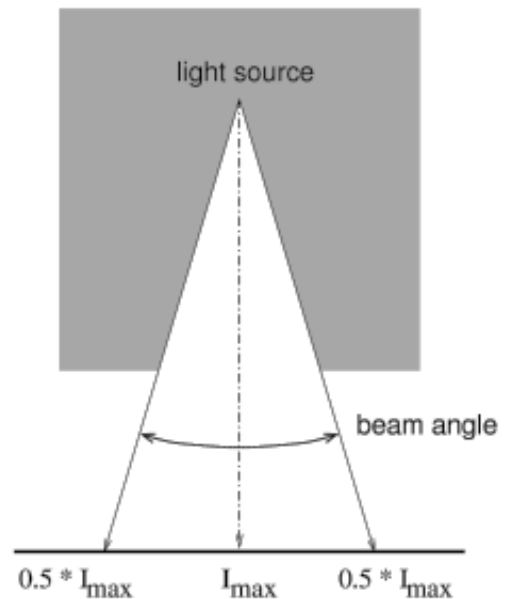
The Field Angle is the angle between the two directions opposed to each other over the beam axis for which the luminous intensity is 10% that of the maximum luminous intensity.

The Beam Spread is a general term, describing the angle between the two directions opposed to each other over the beam axis for which the luminous intensity is a certain fraction of that of the maximum luminous intensity. The amount of that fraction needs to be given in each specific case.

1. Calculate: BEAM WIDTH of any angle (beam, field or cut-off)

BEAM WIDTH = ANGLE x .018 x DISTANCE, or

BEAM WIDTH = MULTIPLYING FACTOR x DISTANCE



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2. Calculate: MULTIPLYING FACTOR of any angle, as follows:

$$\text{MF} = \frac{\text{BEAM WIDTH}}{\text{DISTANCE}} \quad \text{-or-} \quad \text{MF} = \text{ANGLE} \times .018$$

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3. Calculate: ANGLE, as follows:

$$\text{ANGLE} = \frac{\text{MF}}{.018} \quad \text{-or-} \quad \text{ANGLE} = \frac{\text{BEAM WIDTH}}{\text{DIST.} \times .018}$$

4. WIDTH OF LIGHTING BEAM - AT ANY SPREAD ANGLE & DISTANCE

D.in  ft.	ANGLE (in degrees)										
	10	15	20	25	30	35	40	45	50	55	60
5	.9	1.4	1.8	2.3	2.7	3.2	3.6	4.1	4.5	5.0	5.4
10	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	9.9	10.8
15	2.7	4.0	5.4	6.8	8.1	9.5	10.8	12.2	13.5	14.9	16.2
20	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	19.8	21.6
25	4.5	6.8	9.0	11.3	13.5	15.8	18.0	20.3	22.5	24.6	27.0
30	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27.0	29.7	32.4
35	6.3	9.5	12.6	15.8	18.9	22.0	25.2	28.4	31.5	34.7	37.8
40	7.2	10.8	14.4	18.0	21.6	25.2	28.8	32.4	36.0	39.6	43.2
45	8.1	12.2	16.2	20.3	24.3	28.4	32.4	36.5	40.5	44.6	48.6
50	9.0	13.5	18.0	22.5	27.0	31.5	36.0	40.5	45.0	49.5	54.0
55	9.9	14.6	19.8	24.8	29.7	34.7	39.6	44.6	49.5	54.5	59.4
60	10.8	16.2	21.6	27.0	32.4	37.8	43.2	48.6	54.0	59.4	64.8
65	11.7	17.6	23.4	29.3	35.1	41.0	46.8	52.7	58.5	64.4	70.2
70	12.6	18.9	25.2	31.5	37.8	44.1	50.4	56.7	63.0	69.3	75.6
75	13.5	20.3	27.0	33.8	40.5	47.3	54.0	60.8	67.6	74.3	81.0
80	14.4	21.6	28.8	36.0	43.2	50.4	57.6	64.8	72.0	79.2	86.4
85	15.3	23.0	30.6	38.3	46.0	53.6	61.2	68.9	76.5	84.2	91.8
90	16.2	24.3	32.4	40.5	48.6	56.7	64.8	72.9	81.0	89.1	97.2
95	17.1	25.7	34.2	42.8	51.3	59.9	68.4	77.0	85.5	94.1	102.6
100	18.0	27.0	36.0	45.0	54.0	63.0	72.0	81.0	90.0	99.0	108.0