

# PEM

## LIGHTFIXTURE SUPPLEMENTS

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# PEM LIGHTFIXTURE SUPPLEMENTS

## GENERAL INSTALLATION INFORMATION AND SUGGESTIONS

All PEM Submersible Lightfixtures that are supplied in assembled form from our Canadian plant are factory tested as follows:

Full Operational Functions

Dielectric isolation to 1300 Volts AC

Water tightness to 45 PSI, 3.1 bar internal air pressure to comply with IP-68, 1.0m submergence requirement

Approvals are as indicated. For verification consult factory.

### IMPORTANT !

The designers, installers and end-users utilizing the equipment described in this catalogue assume full responsibility for compliance with all applicable codes, requirements and / or ordinances and their applicable articles, intents and consequences. Where the manufacturer / supplier of the equipment described herein does **not** control its application or usage he assumes no responsibility whatsoever for any or all consequences arising out of the application, installation and / or usage of this or any other associated equipment or materials.

**ALL THREADED ELECTRICAL CONNECTIONS MUST HAVE SUITABLE WATER TIGHT THREAD SEALANT APPLIED BEFORE JOINING.**  
**ALL UNDERWATER JUNCTION BOXES & CONDUITS IN A POOL SHALL BE SELF DRAINING IN A VISIBLE LOCATION OUTSIDE OF THE POOL**  
**ALL ELECTRICAL INSTALLATIONS MUST CONFORM WITH ALL APPLICABLE LOCAL ELECTRICAL CODES.**

The use of groundfault circuit interrupters / earth leakage protection is mandatory for all fountain installations.  
The rate of protection varies from North America at 5MA to most other parts of the world at 30MA.

### JOB SITE ASSEMBLY OF LIGHTFIXTURES:

Certain PEM lightfixtures are available outside of approval areas for job site assembly such as for chain lighting etc. The actual supplier and assembler must assume full responsibility in writing for these lightfixtures and electrical cable thus assembled as well as all consequences arising thereof, relieving the fixture manufacturer of all responsibilities whatsoever. The lightfixtures for Job Site Assembly are permanently coded on fixture so as to identify assembler / supplier and date of manufacture.

### LAMPS:

No warranty applies for any lamp supplied by itself or as part of a fixture.

**NOTE:** Halogen Lamps are voltage sensitive. Best life expectancy is at 95/98% of rated voltage as indicated on lamp. **Overvoltage** will shorten life expectancy dramatically. **Undervoltage**, below approximately 80-90% of rated voltage of lamp, the lamps might turn black, but will clean themselves, when operated at full rated voltage for a short time.

For Low Voltage cable length sizing to maintain operating voltage: **See voltage losses for 12V & 24 Cables**

### TIGHTENING TORQUES

Ratchet Torque Wrenches with inch pound (inch / Lbs) or equivalent metric rating are mandatory for tightening of lightfixture facing bolts or leakage & lens breakage might occur .

(Ratchet Type Torque Wrenches for inch pound (inch / Lbs) torques have 3/8" / 95mm square drive, socket is 7/16" / 10.1mm) , always tighten facing bolts evenly cross wise ( 1 & 3 , 2 & 4 or 1 & 4, 3 & 6, 5 & 2 etc) .

All Fixtures except D145, E40 & E41 have on the facing the tightening torque for facing bolts of : 29 inch / lbs / 3.28 Nm

PEM D145 requires the indication on the facing for tightening torque of facing bolts of : 5 inch / lbs / 0.57 Nm

PEM E40 & E41 Face ring bolts require the tightening torque of facing bolts of : 20 inch / lbs / 2.26 Nm

PEM E40 & E41 Base to Body bolts require the tightening torque of : 30 inch/lbs / 3.39 Nm

Tightening Torque for integral cordseal plugs with neoprene seal : 50 Ft / Lbs / 68 Nm

Tightening Torque for J14 Cordseal Compression Nuts : 7.5 Ft / Lbs / 10.2 Nm (.935" Wrench)

Tightening Torque for J14 Cordseal Bases : 60 Ft / Lbs / 82 Nm (.875" Wrench)

(For Cordseals use Ratchet Type Torque Wrenches for foot pound (Ft / Lbs) torques that have 1/2" / 12.7mm square drive with a claw wrench. Never use this type of wrench for facing bolts!)

Torque Wrenches are sold upon request, please enquire

### OZONE ADVISORY:

As there is a possibility of damage caused by free OZONE in the water (introduced by direct discharge of gaseous ozone into pool water) to the organic components of submerged electrical equipment such as the cable, gaskets and seals in contact with the water so purified. No warranty can be given for equipment thus damaged.

### SEAWATER / SALTWATER USAGE:

PEM Underwater Lightfixtures can be supplied in special construction for use in sea water (salt water) at extra cost.

For use in open to ocean lagoons to maximum 15m / 49.21' water depth. Certain PEM Underwater lightfixtures can be supplied with low voltage electrical field lens protection against certain marine growth such as barnacles. For such applications the electrical cable might have to be protected with flexible metal armor (could be by short lengths of stainless steel or plastic thin wall (light weight) tubing pieces threaded over the full length of the immersed cable). Please enquire stating water composition if possible.

# PEM LIGHTFIXTURE SUPPLEMENTS

## PEM Custom Made PAR 56 FSP Lamps

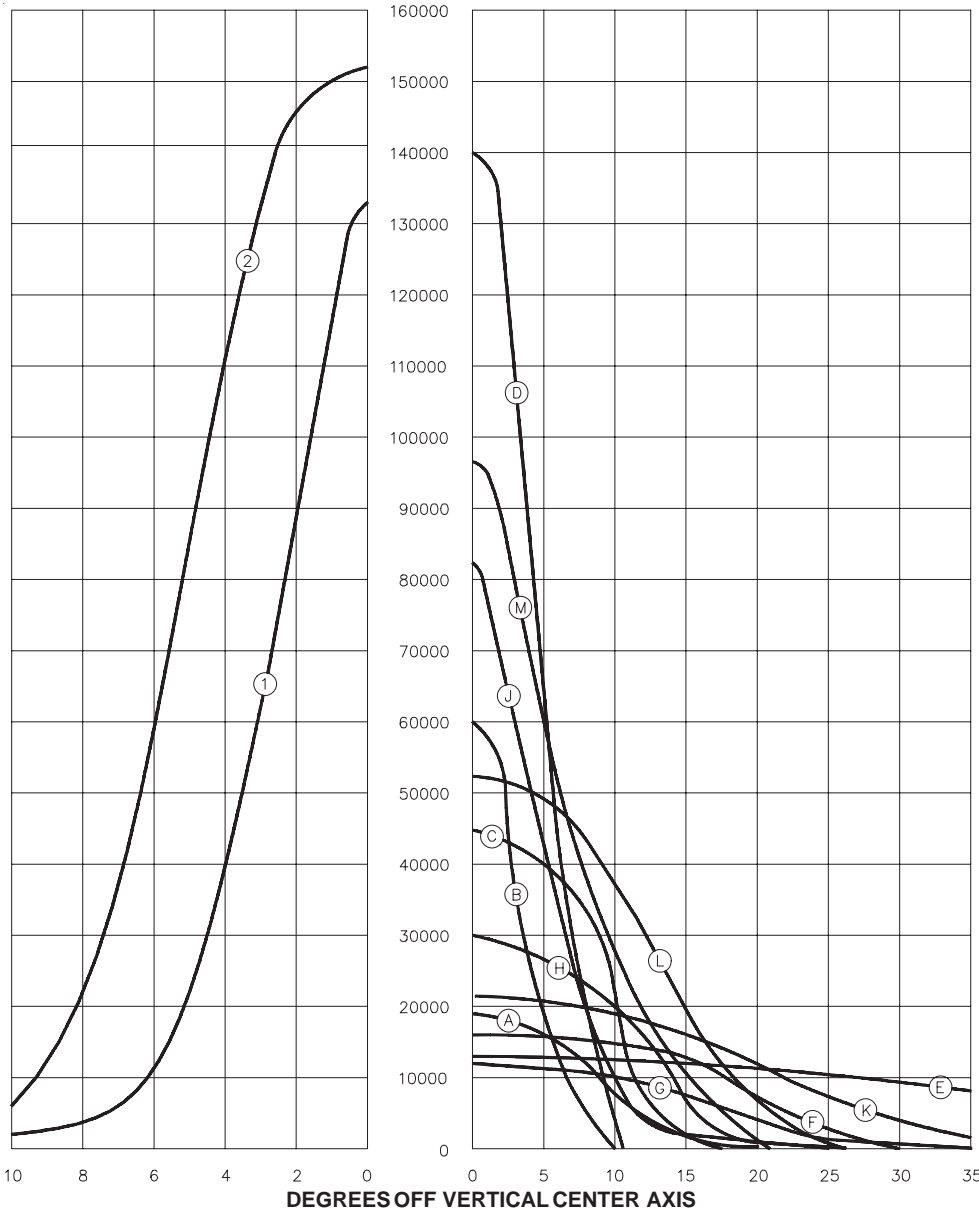
(Sealed beam lamps with Parabolic Aluminized Reflector) Full Spot Projection Halogen Lamps



Screw-On Connections  
24 Volts, 250W, 10.4 Amperes, 3000 Hrs + \*,  
**PEM #362-2005**

Mogul End Prong Connections  
240 Volts, 500W, 2.5 Amperes, 3000 Hrs + \*,  
**PEM #362-2003**

CANDLE POWER COMPARISON CURVES OF VARIOUS PAR56 LAMPS



### Projection Patterns

- FSP:** Full Spot Projection
- NSP:** Narrow Spot Projection
- MFL:** Medium Flood Projection
- WFL:** Wide Flood Projection

### PEM PAR 56 LAMPS:

- 1** 240V, FSP, 500W
- 2** 24V, FSP, 250W  
G.E. 12V
- A** 12V, MFL, 120W
- B** 12V, NSP, 120W
- C** 12V, MFL, 240W
- D** 12V, VNSP, 240W
- E** 12V, WFL, 300W  
PHILIPS 12V
- F** 12V, WFL, 300W  
G.E. 120V
- G** 120V, WFL, 300W
- H** 120V, MFL, 300W
- J** 120V, NSP, 300W
- K** 120V, QWFL, 500W
- L** 120V, QMFL, 500W
- M** 120V, QNSP, 500W

**During lamp installation and testing of Halogen Lamps in open fixtures suitable eye protection must be worn.**

**Available while stocks last:  
Safety Transformers - T301  
230V x 12V & 24V, 300VA (W),  
As Per IP 23:PEM #385-3330**

\* **Rated Average Life Hours** depend on rated supply voltage. **Over voltage** and high voltage spikes will shorten life hours. **Undervoltage** by more than 10% can result in halogen tubes turning black but by using rated voltage for approximately 30 minutes the tubes will clean themselves.

# PEM LIGHTFIXTURE SUPPLEMENTS

## VOLTAGE DROPS (LOSSES) IN 24 V SUBMERSIBLE ELECTRICAL CABLE

To establish Amperes - Watts : Volts = Amperes

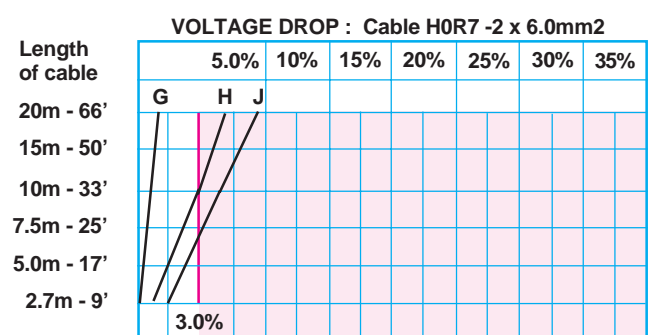
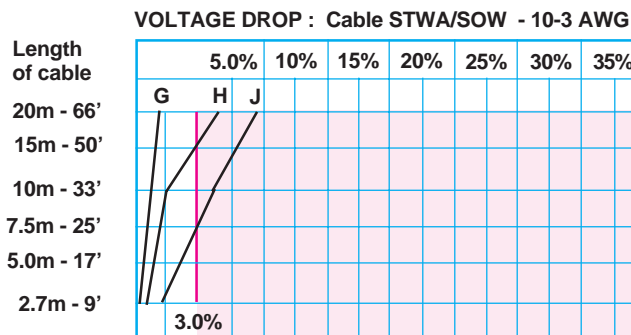
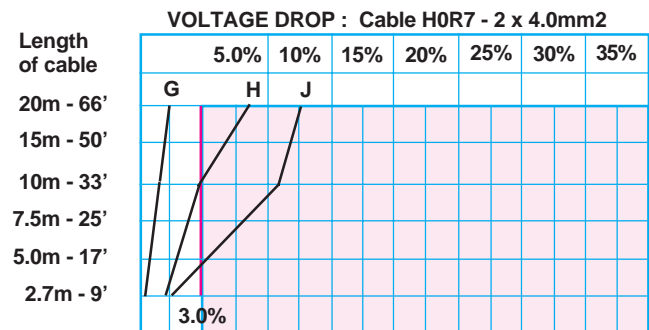
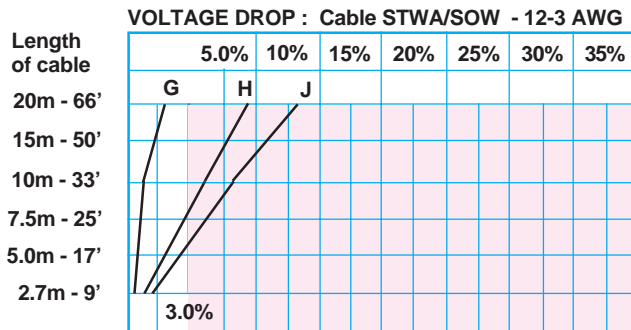
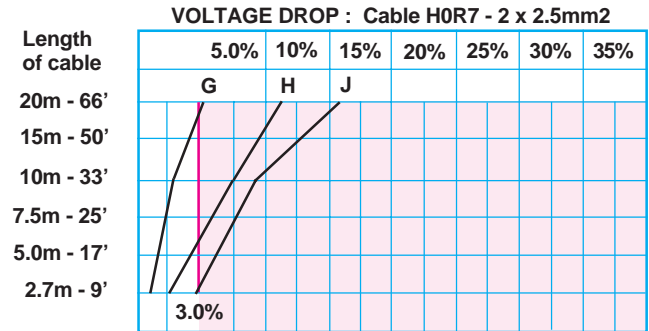
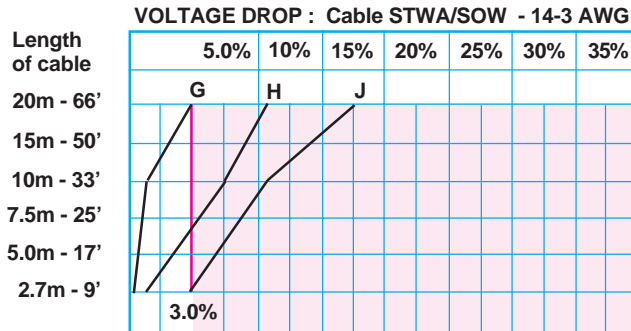
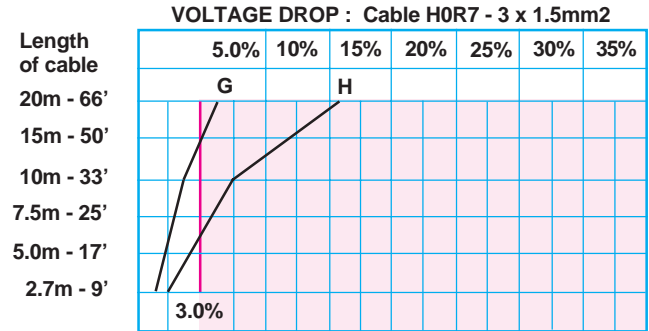
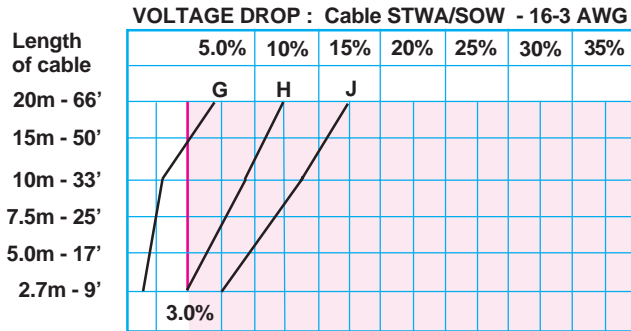
Voltage drops ( Losses) in shaded areas require special attention as most Halogen Lamps might turn black on voltages reduced by 5% or more. To clean lamps operate for short period at full rated voltage.

Requires  
Voltage  
Increase

LAMPS tested:

#	Volts	Watts	Amperes
G	24	50	1.8
H	24	150	5.4
J	24	250	8.4

3% = Permissible Voltage Drop (North America)  
3 Wire Low Voltage Cable in North America,  
2 Wire Low Voltage cable outside of North America



Actual Voltage Drop Tests were conducted at 23 C Ambient air temperature with straight lengths of cable connected to a 120V x 12V - 1000 VA Transformer and lamp holder leads (where applicable) as utilized in PEM Submersible Lightfixtures.

# PEM LIGHTFIXTURE SUPPLEMENTS

## VOLTAGE DROPS (LOSSES) IN 12 VAC SUBMERSIBLE ELECTRICAL CABLE

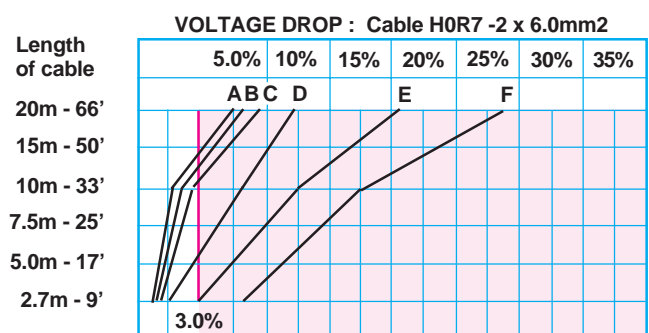
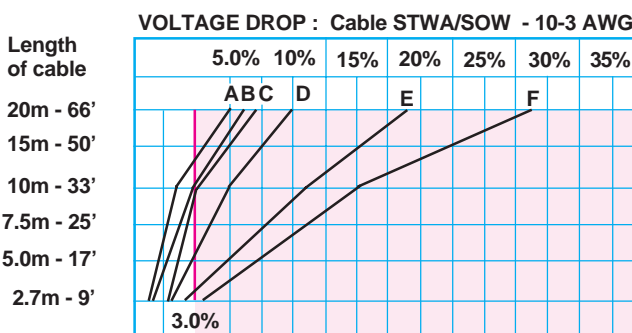
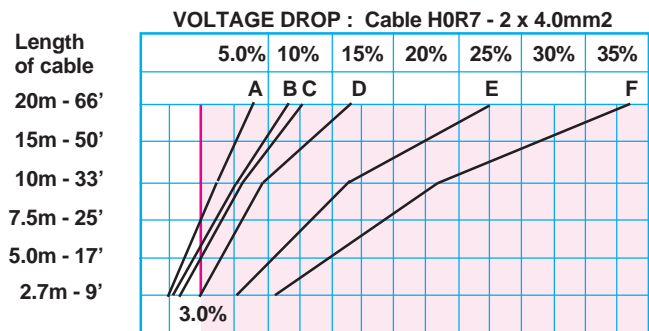
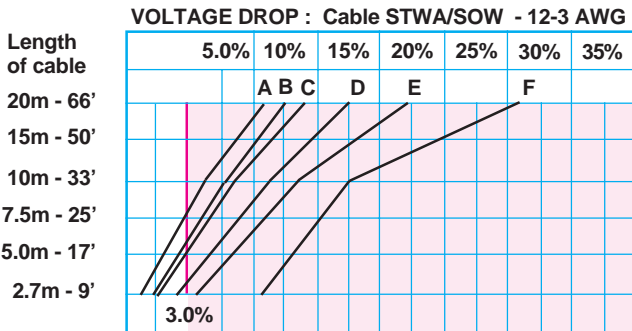
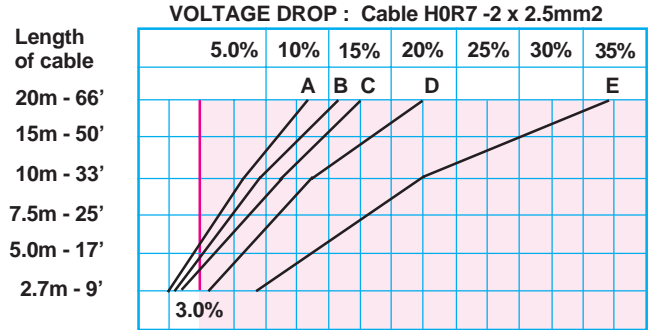
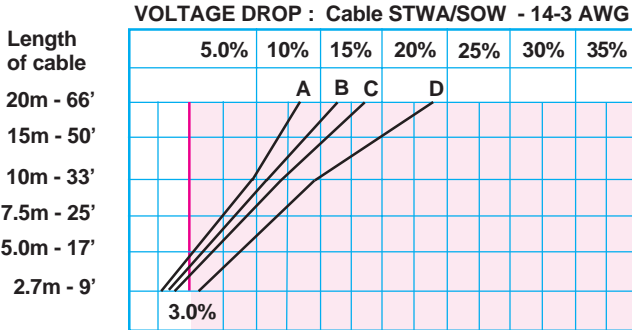
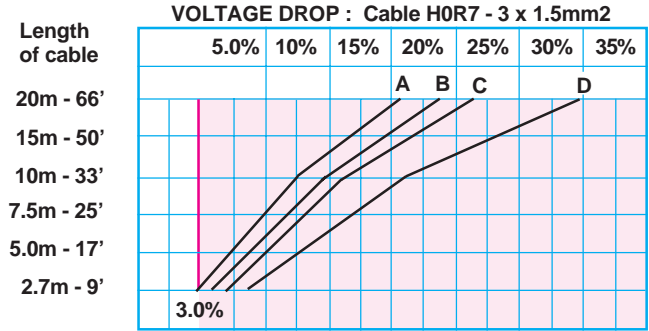
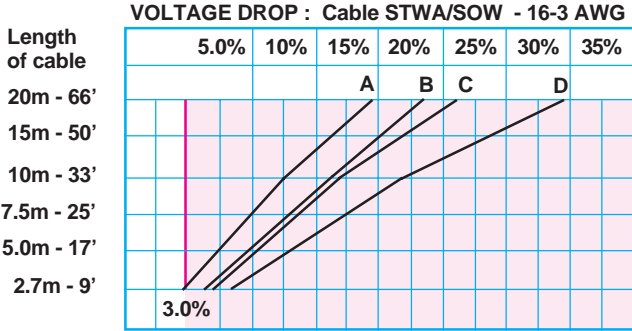
To establish Amperes - Watts : Volts = Amperes

- 3% = Permissible Voltage Drop (North America)
- 3 Wire Low Voltage Cable in North America, Max. 15 VAC
- 2 Wire Low Voltage cable outside of North America

Requires Voltage Increase

LAMPS tested:			
#	Volts	Watts	Amperes
A	12	50	4.5
B	12	65	5.5
C	12	75	6.1
D	12	100	8.8
E	12	240	13.7
F	12	300	24.4

Voltage drops ( Losses) in shaded areas require special attention as most Halogen Lamps might turn black on voltages reduced by 5% or more, to clean lamps, operate for short period at full rated voltage.



Actual Voltage Drop Tests were conducted at 23 C Ambient air temperature with straight lengths of cable connected to a 120V x 12V - 1000 VA Transformer and lamp holder leads (where applicable) as utilized in PEM Submersible Lightfixtures.

# PEM LIGHTFIXTURE SUPPLEMENTS

## Color Selection of Optional Flat, Dichro. Lenses

Dichroic Color Lenses have a minimum loss of light



**Optional PEM tempered Flat Dichroic Colour Lenses are available in 3 Lens Sizes:**

The dichro color coating is on the inside of the lens, protected from water and surface abrasion.

PEM Dichroic Color Lenses are for submersible or dry use with PEM Lightfixtures and PEM Lens Gaskets.

**Size #35-1-0000**, 80mm / 3.110" diameter for: **C20, E40 & E41**

**Size #35-2-0000**, 143mm / 5.625" diameter for: **C131, C133, E150-1**

**Size #35-3-0000**, 213mm / 8.375" diameter for: **E600**

Lens Shades (Optional) are required to contain opposite prismatic stray colors around lenses

**PEM Flat Dichroic Color Lenses** for PEM Lightfixtures other than listed above, require special adapters which are listed with the fixtures. **PEM custom made Convex Dichroic Colour Lenses are available in 80mm, 143mm & 213mm sizes**

**See Lightfixture Supplements # 7 for details**

These lenses can replace convex color lenses without adapter, however Lens Shades (Optional) are required to contain opposite prismatic stray colors around lenses. Please enquire at factory.

## Color Selection of Standard Convex Lenses

**NOTE:** Standard Convex Color Lenses, especially Blue & Green have Lumen loss up to 85%, Red color loses app. 50%. Use Dichroic Lenses that have a Lumen loss of 5% or less.



Convex Color Lenses are available AT NO EXTRA CHARGE WHEN INCLUDED WITH PURCHASE OF FIXTURES.

Will fit all PEM Submersible Lightfixtures except D145, E100 & E900.

**80mm Size / 3.110"** for **C21, E40, E41 & M 900 Series Spray Apron Modules**

**143mm / 5.625"** for **C131, C133, E150, E150, E200, E300, E700 & E800**

**213mm / 8.375"** for **E 500, E600 & E1100**

**See Lightfixture Supplements - 7 for details**

All Convex Lenses are tempered, for submerged or dry use with PEM Lightfixtures and PEM Lens Gaskets.

## PEM LIGHTFIXTURE PARTS & LAMP SPECIFICATIONS - 7

PEM FIXTURES	C21-1-00 C21-2-10 C21-4-30	C21-1-61 C21-2-21 C21-3-28	D145	E40LV E41LV	E40JC E41JC	E40-MC E41-MC	E40-DW E41-DW	E100	E150-1	E150-2	E150-3
Type of Lamp(s)	MR 16	GU-10	PAR 38*	MR16	Bi-Pin	T4-MC	GU10	A19	PAR38*	R40*	R40*
Lamp Connection	GX 5.3	GZ-10	E26/27	GX 5.3	6.35-1	E-11	GZ-10	E26/27	E26/27	E26/27	E26/27
240V, max. Watts	-	50	150	-	-	250	50	100	250	300	-
120V, max. Watts	-	50	150	-	-	250	50	100	150	150	300
24V, max. Watts	75	-	100	75	150	-	-	100	120	120	150
12V, max. Watts	75	-	100	75	100	-	-	100	100	100	100
Rockguard #10-2/-6	-	-	-	-	-	-	-	-	X	X	X
Rockguard #10-3/-8/-9	-	-	-	-	-	-	-	-	-	-	-
Rockguard #10-1	-	-	-	-	-	-	-	X	-	--	-
Lensguard in Facing -10	X	X	-	-	-	-	-	-	-	-	-
Lensguard in Facing -10-7	-	-	-	-	-	-	-	-	X	X	X
Lensguard in Facing 'A'	-	-	-	X	X	X	X	-	-	-	-
Lensguard in Facing 'B'	-	-	X	-	-	-	-	--	-	-	-
<b>FIXTURE PARTS</b>											
Facing Bolts (Set)		-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
Lamp Connector(s)		-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
Lamp Rim Clamps, Pair		X	-	-	X	-	-	-	-	-	-
Lamp Mounting Plate		-	-	-	-	-	-	-	-	-	-
Lamp / Plate Spring		-	-	-	-	-	-	-	-	-	-
Lens Gasket		-13	-13	-	-13	-13	-12	-13	-13	-13	-13
Clear Flat Lens		-30-1	-30-1	-	-30-1	-30-1	-30-1	-	-30-2	-30-2	-30-2
Dichro Color Lens (Color ?)	-35-2	-35-2	-	-35-2	-35-2	-35-2	-35-2	-	-35-2	-35-2	-35-2
Clear Convex Lens		-14-2	-14-2	-	-14-2	-14-2	-14-2	-	-14-2	-14-2	-14-2
Clear Convex Globe		-	-	-	-	-	-	X	-	-	-
Clear Convex Fresnel Lens	-14-1	-14-1	-	-14-1	-14-1	-14-1	-14-1	-	-	-	-
Color Convex Lens (Color ?)	-15-1	-15-1	-	-15-1	-15-1	-15-1	-15-1	-	-15-2	-15-2	-15-2
Cordseal Gland		-	-	-	-17	-17	-17	-17	-17	-17	-17
Cordseal Washer		-	-	-	-18	-18	-18	-18	-18	-18	-18
Cordseal Plug		-	-	-	-19	-19	-19	-19	-19	-19	-19
Cord Seal J Type**	X	X	X	-	-	-	-	-	-	-	-
Body 'O' Ring Seal		-	-	X	-	-	-	-	-	-	-
Base 'O' Ring Seal		-	-	-	X	X	X	X	-	-	-

\* = Verify lamp size (M.O.L.) to fit lightfixture

\*\*= Cord Seal, Cable Size? Check PEM Junction Boxes & Cord Seals

## PEM LIGHTFIXTURE PARTS & LAMP SPECIFICATIONS - 8

PEM FIXTURES	C131-1	C131-3	C131-4	C131-5	C131-6	C131-7	C131-8	C131-9	C131-10
	C133-1	C133-3	C133-4	C133-5	C133-6	C133-7	C133-8	C133-9	C133-10
	" +B46	" +B46	" +B46	" +B46	" +B46	" +B46	" +B46	" +B46	" +B46
Type of Lamp(s)	AR111	3xMR16	4xMr16	3xGU10	3xGU10	4xMR16	4xMR16	3xGU10	3xGU10
Lamp Connection	Bolts	3xG3.35-1	4xGZ-10	3xGZ-10	3xGZ-10	4xG3.35-1	4xGZ-10	3xGZ-10	3xGZ-10
240V, max. Watts	-	-	-	50x3	3x50	-	-	3x50	50x3
120V, max. Watts	-	-	-	50x3	3x50	-	-	3x50	50x3
24V, max. Watts	-	3x75	75x3	-	-	4x75	75x4	-	-
12V, max. Watts	100	3x75	75x3	-	-	4x75	75x4	-	-
Rockguard #10-2/-6/-7		X	X	X	X	X	X	X	X
Lensguard # 10-7	X	X	X	X	X	X	X	X	
<b>FIXTURE PARTS</b>									
Facering Bolts (Set)	-	-11	-11	-11	-11	-11	-11	-11	-11
Lamp Connector(s)	Bolts	-12	-12	-12	-12	-12	-12	-12	-12
Lamp Mounting Plate	-	-	-50	-50	-50	-50	-50	-50	-50
Lamp / Plate Spring	-	--	-51	-51	-51	-51	-51	-51	-51
Lamp Holding Plate/Bolt	-	-55	-55	-55	-55	-55	-55	-55	-55
Lens Gasket	-13	-13	-13	-13	-13	-12	-13	-13	-13
Clear Flat Lens	-30-2	-30-2	-30-2	-30-2	-30-2	-30-2	-30-2	-30-2	-30-2
Dichro Color Lens (Color ?)	-35-2	-35-2	-35-2	-35-2	-35-2	-35-2	-35-2	-35-2	-35-2
Clear Convex Lens	-14-2	-14-2	-14-2	-14-2	-14-2	-14-2	-14-2	-14-2	-14-21
Color Convex Lens (Color ?)		-15-2	-15-2	-15-2	-15-2	-15-2	-15-2	-15-2	-15-2
Cord Seal J Type**	X	X	X	X	X	X	X	X	X

\*\*= Cord Seal, Cable Size? Check PEM Junction Boxes & Cord Seals

## PEM LIGHTFIXTURE PARTS & LAMP SPECIFICATIONS - 9

PEM	E200	E200JC	E300-1	E300-2	E300-3	E500-1	E500-2	E500-LV	E600-1	E600LV	E600-3/5	E600-4/6LV
Type of Lamp(s)	MC	JC	MC	JC	AR111*	PAR 56	PAR 56	PAR 56	PAR 56	PAR 56	8xGU 10	8xMR 16
Lamp Connection	E11	G6.35-1	E11	G6.35-1	Bolts	GX16d	GX16d	Bolts	GX16d	Bolts	GZ-10	GX 5.3
240V, max. Watts	-250	-	-250	-	-	-500	-500	-	-500	-	-400	-
120V, max. Watts	-250	-	-250	-	-	-500	-500	-	-500	-	-400	-
24V, max. Watts	-	-150	-	-150	-	-	-	-250	-	-250	-	600**
12V, max. Watts	-	-100	-	-100	-100	-	-	-300	-	-300	-	600**
Rockguard #10-2/-6	X	X	X	X	X	-	-	-	-	-	-	-
Rockguard #10-3/-8/-9	-	-	-	-	-	X	X	X	X	X	X	-
Lensguard -10-7	X	X	X	X	X	X	X	X	X	X	X	X
<b>FIXTURE PARTS</b>												
Facering Bolts (Set)	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
Lamp Connector(s)	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
Lamp Lamp Plate	-	-	-	-	-	-	-	-	-	-	-42	-42
Lamp Plate/Bolt	-	-	-	-	-	-	-	-	-	-	-44	-44
Lens Gasket	-13	-13	-13	-13	-13	-13	-13	-13	-13	-13	-13	-13
Clear Flat Lens	-30-2	-30-2	-30-2	-30-2	-30-2	-30-3	-30-3	-30-3	-30-3	-30-3	-30-3	-30-2
Dichro Color(?)Lens	-35-2	-35-2	-32-2	-35-2	-35-2	-35-3	-35-3	-35-3	-35-3	-35-3	-35-3	-35-2
Clear Convex Lens	-14-2	-14-2	-14-2	-14-2	-14-2	-14-3	-14-3	-14-3	-14-3	-14-3	-14-3	-14-2
Convex Color(?)Lens	-15-2	-15-2	-15-2	-15-2	-15-2	-15-3	-15-3	-15-3	-15-3	-15-3	-15-3	-15-3
Cordseal Gland	-17	-17	-17	-17	-17	-17	-	-17	-17	-17	-	-
Cordseal Washer	-18	-18	-18	-18	-18	-18	-	-18	-18	-18	-	-
Cordseal Plug	-19	-19	-19	-19	-19	-19	-	-19	-19	-19	-	-
Cord Seal(s)JType***	-	-	-	-	-	-	X	-	-	-	X	X
St. St. Reflector	-37	-37	-	-	-	-	-	-	-	-	-	-
St. St. Wiring Cover	-39	-39	-39	-39	-	-	-	-	-	-	-	-

## PEM LIGHTFIXTURE PARTS & LAMP SPECIFICATIONS - 10

PEM	E700	E700JC	E800	E910	E950JC	E950LV	E950JC	E1100	E1100+35-3
Type of Lamp(s)	MC	Bi-Pin	MC	A19/26	MC	A19/26	Bi-Pin	PAR 64	PAR 64
Lamp Connection	E11	G6.35-1	E11	A19/26	E11	A19/26-	G6.35-1	GX16d	GX16d
240V, max. Watts	-250	-	-500	-100	--	-	-	-**	-**
120V, max. Watts	-250	-	-500	-100	--	-	-	-1000	-1000
24V, max. Watts	-	-150	-	-	-150	-100	-150	-	-
12V, max. Watts	-	-100	-	-	-100	-60	-100	-	-
Rockguard 10-4	-	-	-	X	X	X	X	-	-
Rockguard #10-2/-6	X	X	X	-	-	-	-	-	-
Rockguard #10-3/-8/-9	-	-	-	-	-	-	-	X	X
Lensguard -10-7	X	X	X	-	-	-	-	X	X
<b>FIXTURE PARTS</b>									
Facering Bolts (Set)	-11	-11	-11	-11	-11	-11	-11	-11	-11
Lamp Connector(s)	-12	-12	-12	-12	-12	-12	-12	-12	-12
Lens Gasket	-13	-13	-13	-13	-13	-13	-13	-13	-13
Clear Flat Lens	-30-2	-30-2	-30-2	-30-2	-30-2	-30-3	-30-3	-30-3	-30-3
Fresnel Lens	-	-	-14	-14	-14	-14	-	-	-
Flat Dichro Color(?)Lens	-35-2	-35-2	-32-2	-35-2	-35-2	-35-3	-35-3	-35-3	-35-3
Clear Convex Lens	-14-2	-14-2	-14-2	-14-2	-14-2	-14-3	-14-3	-14-3	-14-3
Convex Color(?) Lens	-15-2	-15-2	-15-2	-15-2	-15-2	-15-3	-15-3	-15-3	-15-3
Cordseal Gland	-17	-17	-17	-17	-17	-17	-	-17	-17
Cordseal Washer	-18	-18	-18	-18	-18	-18	-	-18	-18
Cordseal Plug	-19	-19	-19	-19	-19	-19	-	-19	-19
Cord Seal(s) J Type***	-	-	-	-	-	-	-	X**	X**
Flat Dichro Lens Adapter	-	-	-	-	-	-	-	-	X
Adapter Lens Gasket	-	-	-	-	-	-	-	-	-13
Adapter Bolts (Set)	-	-	-	-	-	-	-	-	-11A

X\*\* = 2 x Paired 120V, 1000W for 240V

\*\*\* = Cord Seal Size(s), see Junction Boxes, Cordseals & Conduit Stup Ups