

# GENERAL INSTALLATION INSTRUCTIONS – MODEL DEF™



## **CAUTION! Never Expose Eyes or Skin to UV-C - Read all Materials before Starting**

### **SAFETY CONSIDERATIONS**

Improper installation, adjustment, alteration, service, maintenance, or use can cause fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your supplier for information or assistance. The qualified installer or agency must use factory kits or accessories when installing this product. Refer to the individual instructions packaged with kits or accessories when installing them. Follow all safety codes, wear safety glasses and work gloves. Read all instructions thoroughly and follow any warnings or cautions attached to any accessed area. Consult local building codes and the National Electrical Code (NEC) for special requirements.

Understand the signal words **DANGER, WARNING or CAUTION**. These words are universally used for overall safety. **DANGER** identifies the most serious hazards, which will result in severe personal injury or death. **WARNING** signifies hazards, which could result in personal injury or death. **CAUTION** is used to identify unsafe practices, which would result in minor personal injury or product and property damage.



**WARNING:** Before installing or servicing this unit, turn off or disconnect all power, there may be more than one (1) switch.



### **CAUTION-UV Exposure Precautions:**

1. Doors, covers, lamp mounting brackets, access panels, and removable components that give direct access to Ultraviolet (UV) lamp systems shall be equipped with an interlocking mechanism that removes power from the Ultraviolet (UV) lamp system
2. There should be no openings, holes or joints that allow UV light leakage.
3. Drain pans shall be metallic.
2. Some UV installations may require protective barriers (not supplied) to protect users, service personnel and non-metallic parts from UV energy.

#### **Barriers** (if required, not supplied):

- a. Barrier should be constructed of a material that will not be affected by UV energy (e.g. metal)
- b. Non-Metallic materials may be protected by directly attached barriers such as aluminum coated tape.
- c. Both the unit inlet and outlet should be considered as possible Ultraviolet (UV) radiation paths when determining barrier locations.
- d. The unit filters are not considered Ultraviolet (UV) radiation barriers.
- e. *Removable barriers shall be marked with the words "Caution" and the following or equivalent: "UV LIGHT SOURCE - KEEP PROTECTIVE BARRIER IN PLACE"*



### **CAUTION-Material Exposure / degradation:**

1. Any non-metallic parts exposed to UV shall be shielded  
Note: Metallic barriers, and aluminum tape are appropriate means of shielding. Non-metallic parts include, but not limited to conductors, connectors, enclosures, housings, drain pans, support pieces, gaskets and filters.
2. Protective materials can include barriers (referenced above), conduit, aluminum tape, etc. Please reference ASHRAE® 2016-Systems and Equipment handbook for additional information<sup>1</sup>.
3. Inorganic materials such as glass, glass fibers, and metal are not affected by UV-C exposure<sup>123</sup>.
4. Shield all organic material components within 5 ft (1.5 m) of the UV lamp<sup>1</sup>.

<sup>1</sup> ASHRAE-2016. UV-C Photodegradation of Materials. Systems and Equipment Handbook. 17.5-17.6

<sup>2</sup> Kaufman, R.E. 2017. Study the HVAC System Photodegradation Caused by the Low Level UVC Light Irradiance Used for Coil Maintenance and Air Stream Disinfection. ASHRAE Research Project 1724, Final Report

<sup>3</sup> Kauffman, R. 2011. Study the degradation of typical HVAC materials, filters and components irradiated by UVC energy. ASHRAE Research Project RP-1509, Final Report.

## General:

1. DEF™ Fixtures can be used within an air handler to bathe surfaces, the air or both with UV-C energy. For surfaces, locate fixtures at known growth areas such as coils, drain pans and/or around humidifiers, etc.
2. Before starting, check for power availability, on/off toggle switch, door safety switch, UV-C Hour Meter and radiometer (if used) location to be sure there is access to all components.

## What's included:

- DEF Plug-n-Play (PnP) Fixture
- UV-C Lamp (Typ) (Note: Fixture also sold without lamp)
- DEF installation Kit:
  - Installation Operation Manual (IOM)
  - Door Warning Label
  - Product Specification Label
  - Self-Drilling Mounting Screws (x4)
  - Fixture Top Screws (x2)
  - Dome Plug (x1)

## Installation Process (structural surfaces only):

- A. Consult all applicable codes and the NEC before installing. Check fixture label(s) for the correct power requirements and supply power from a suitable, protected (fused), and grounded power source.



**CAUTION-DANGER: Using other than labeled voltages will void product warranty and may damage the entire system. It is recommended that lamps be operated continuously to avoid mold and bacteria growth, especially when the fan is off.**



- B. All UV-C system accesses must be power-interlocked from the source to turn lamp(s) off when the UV-C system is accessed. Access points should have signs in appropriate languages alerting maintenance personnel to the possible hazard of looking at or exposing skin to UV-C energy (English label provided). Lamp accesses may be equipped with glass or Lexan® windows to safely view their operation. Ordinary glass or Lexan® will typically block UV-C energy. Its recommended that any glass be tested for UV-C transmission.
- C. Determine the most desirable location for the intended use and install reflective material (if used).
- D. A fixture may be used as a template to mark and drill mounting holes for your application. Install fixture(s) and wire in accordance with all applicable national, state and local codes. (see Installation Suggestions).
- E. Before installing lamps clean them using isopropyl alcohol and a lint free cloth (recommended). Grasp the non-glass ends (thumb and index fingers) and carefully push lamp pins into socket pin slots until seated. Rotate until one distinct click is heard. **Note: One click is required to hold lamp safely.**

## Installation Suggestions - DEF Products

Suggestions are intended for qualified installers only. Refer to layout drawing (if supplied) when using the following suggestions:



### 1. Support material (Not Supplied/ By others)

- Use appropriate gauge, preformed angle of galvanized, stainless or aluminum for each row's horizontal support. Uni-Strut®, Kindorf® or equal may also be used and cut to size in the field. These same materials may serve as vertical supports when required. **Note:** When more than one angle is used to span the fixture width or height, overlap the angles at the fixtures mounting holes to provide a stronger structural joint.

**2. Install row(s) as follows:**

- From a layout drawing (example, page 4), note all dimensions, (e.g. from the coil to the UV-C fixture(s), from the bottom of the plenum to the first row, and between rows (row to row)). Mount vertical supports, then horizontal supports using the layout drawing as a reference.
- Unpack fixtures and remove lamp(s) and fixture covers and set aside (Pic. 1).
- Position the correct number and size of fixtures for each row, end to end on the horizontal support being sure that plug-n-play (PnP) plugs (male to female) mate properly (Pic. 2).
- Plug each fixture into the next (Pic. 3) and tuck the mated plugs into the fixture *without* the plastic bushing (Pic. 4).
- Push the fixtures together until the bushing slides (“clicks”) all the way into the next fixture (Pic. 5 & 6).
- Repeat this process with all the fixtures necessary to complete the row.
- With the fixtures on their horizontal support, position them to allow for finish wiring at one end. When a 34” fixture is part of a row, it is recommended it be used on the end for where finish wiring will take place.
- Cut off PnP plug at the wire-to-power end to accommodate wiring to power (Pic. 7).
- Tuck the PnP plug on the unused end into its fixture and seal fixture end by installing a “dome plug” (supplied) (Pic. 8).
- Use the self-drilling screws (supplied) to fasten the fixtures to the horizontal support as needed.
- Continue this procedure until “all” rows (if more than one) are completed.
- Replace the removed fixture covers and using supplied screws, tighten.
- Use the “dome plugs” to cover any open ½” knock-outs remaining (Pic 8).

**3. Wiring fixtures and terminating.**

1. Using the appropriate electrical components (not supplied) per the NEC, State and local codes, bring the appropriate power to the “finish wiring” end of fixtures via conduit to finish all the connections.
2. Use available metal or aluminum tape to cover and protect any UV-C susceptible materials (see material degradation above).
3. **NOTE: Maximum number of fixtures that can be PnP wired together in one row cannot exceed 6A. Refer to ballast label on fixture for specific amps relating to each fixture at different voltages or Power Consumption chart below.**

**4. Labeling Instructions**

- Apply “System Lamp Watt Specification Label” to exterior of location where fixtures are installed. Complete label by marking the quantity of the specific fixture(s) installed in unit and the total lamp watts.

Fixture	Watt	AMP	Volts	Qty	Total
<input type="checkbox"/> 20W (1000) 1000000	1000	100	V		
<input type="checkbox"/> 20W (1000) 1000000	1000	100	V		
<input type="checkbox"/> 20W (1000) 1000000	1000	100	V		
<input type="checkbox"/> 20W (1000) 1000000	1000	100	V		

UVR  
UV Radiation  
WARNING

**5. Power considerations**

- Read fixture label power requirements – sum the power requirements, wire and fuse accordingly.
- Run power-in wiring from a suitable, protected and grounded power source and in accordance with NEC, State and local codes. Power should be switched from outside the plenum and **“must”** then run through a properly rated, SPST interlock door switch (Pic. 10), at each access.
- Apply supplied Door Warning Label(s) (Pic. 9) on all access doors/ports/covers/panels.

**6. Lamps**

- Wiping all lamps down with isopropyl alcohol and a lint free cloth before using is recommended (this step is not necessary for the EncapsuLamp™ – FEP coated/sleeved lamp).
- Lamps should be replaced annually (8760 hrs).

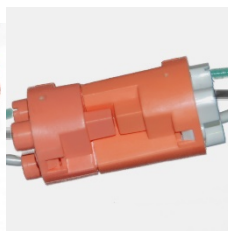
**Installation Detail**



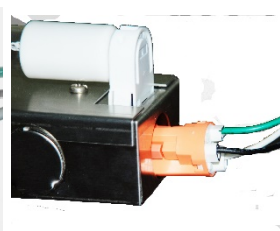
Pic 1: Remove Lamp & Cover set aside.



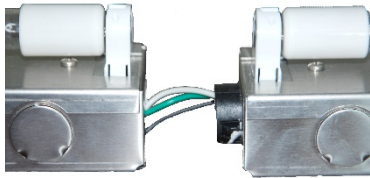
Pic 2: Match Plugs (male/female)



Pic 3: Push Together



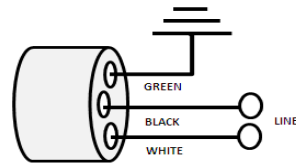
Pic 4: Push Plugs into Fixture Without Bushing



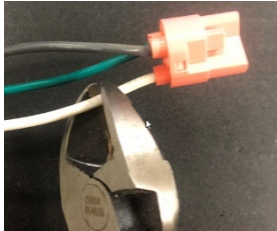
Pic 5: Push fixtures together until bushing clicks together. (note: Fixture top will need to be removed to secure to support structure)



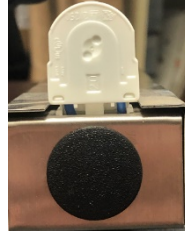
Pic 6: Fixtures together



Dwg 1: Wiring Diagram



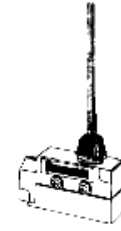
Pic 7: Cut off PnP Plug



Pic 8: Dome Plug



9: Warning Label (supplied) - Apply To: Access Doors/Ports/Panels



10: SPST Interlock Door Safety Switch Example

**Electrical Ratings:** 3 Amps, 120V Maximum / 1.5 Amps, 240V Maximum

**Power Consumption:**

<u>MODEL #</u>	<u>Part Number</u>	<u>Watts*</u>	<u>Amps at 120V*</u>	<u>Max °F</u>	<u>Lamp Watts</u>
DEF-221-T5-SO-120	52843541	34	.283	150°F	25W
DEF-341-T5-SO-120	52853541	45	.375	150°F	36W
DEF-221-T5-HO-120	52844541	54	.450	150°F	46W
DEF-341-T5-HO-120	52854541	80	.666	150°F	78W

\*To calculate amps, divide watts by supplied voltage

\*\*Review fixture label for rating at 240V

**Compliance:** Underwriter Laboratories (UL) ABQK, Accessories, Air Duct Mounted. Tested in accordance with ANSI/UL 1995, ANSI/UL 153, ANSI/UL 1598 and ANSI/UL 867.

Duct-mounted Germicidal Assembly

The health aspects associated with the use of this product and its ability to aid in the disinfection of environment air have not been investigated by UL. Air duct mounted accessory with respect to electrical shock, fire and casualty hazards only. 3YT6



**NOTE:** Grounding should be line-to-neutral (see Dwg. 1 for wiring diagram).

**WARNING:** Eye damage may result from directly viewing the light produced by these lamps. To reduce the risk of exposure to UV radiation, take UV-radiation protective measures for personnel during servicing.

**WARNING:** This fixture is designed for use with germicidal UV-C lamps and must be installed in compliance with competent technical directions so that user's eyes and bare skin will not be subjected to injurious rays.

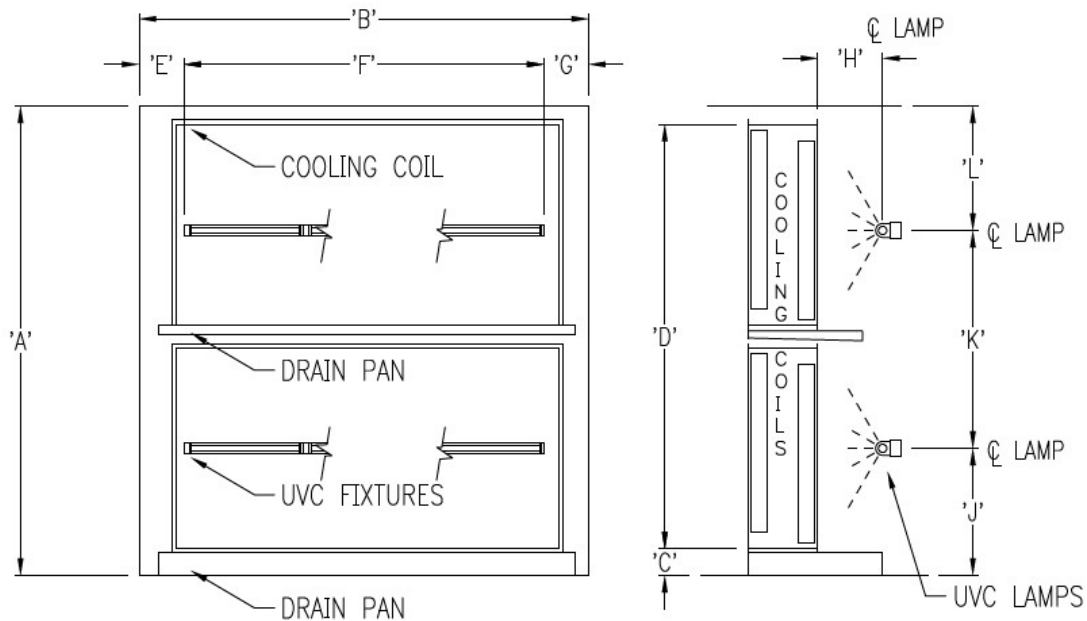
**WARNING:** There shall not be any supply or return air openings or any other openings that are in direct line of sight of the UV bulb.

**WARNING:** There shall not be any openings in the duct that would emit light.

**WARNING:** UV Light Hazard. To Prevent exposure to ultraviolet light, be sure the ultraviolet air treatment system is disconnected before servicing any part of the HVAC system or removing any access panel or the equivalent.

**CAUTION:** Personal Injury Hazard. Power supply can cause electrical shock. Disconnect power supply before servicing or beginning installation.

**CAUTION:** Risk of exposure to excessive ultraviolet (UV) radiation - Do not operate without complete lamp enclosure in place or if sight lens is damaged.

**Layout Drawing Example****Maintenance:**

The intensity of the ultraviolet energy emitted from the UV lamps is dependent on the cleanliness and lamp age. The surface of the lamp should be kept as clean as possible for optimum intensity. Depending on the filtration level of the HVAC system and the general hygiene of the building, periodic cleaning may be necessary. Before attempting any maintenance procedures, always follow all warnings and cautions as detailed in this maintenance section.

**Cleaning Lamps**

Note: If lamps are found to be broken, see the proper warning and cautions below regarding broken lamps and hazardous vapors.

1. Disconnect all electrical power to the unit and the UV lamps.
2. Wearing soft cloth gloves and safety glasses grasp lamp with fingers and twist lamp until it can be removed from tombstone.
3. Wipe down each lamp with a clean cloth and isopropyl alcohol. Avoid touching lamp glass with hands as skin oils can accelerate lamp degradation. (If lamps are coated with Teflon they can be touched with bare hands).
4. Apply dielectric grease to 4 pins. Place lamp back in tombstone and twist lamp until it clicks into place.

**Replacing the Lamps**

Ultraviolet lamps should be replaced annually if operated continuously or after 9,000 hours of use if operated intermittently. Replacement lamps must be the specific size and wattage as originally supplied from the factory.

Note: Although the lamps may continue to generate a characteristic blue glow beyond 9,000 operating hours, the ultraviolet energy emitted by the bulbs degrades over time and will no longer provide the intended benefit.

### Lamp Disposal:

UV lamps should be treated the same as other mercury-containing devices, such as fluorescent bulbs, according to local regulations. Most lamps must be treated as hazardous waste and cannot be discarded with regular waste. Low-mercury bulbs often can be discarded as regular waste; however, some states and local jurisdictions classify these lamps as hazardous waste. The U.S. EPA's universal waste regulations allow users to treat mercury lamps as regular waste for the purpose of transporting to a recycling facility. The National Electrical Manufacturers Association (NEMA) maintains a list of companies claiming to recycle or handle used mercury lamps at [www.lamprecycle.org](http://www.lamprecycle.org)

## EQUIPMENT WARRANTY

**This warranty supersedes and replaces any warranty statements orally made by a Salesperson, Distributor or Dealer or contained in the written instructions or other Brochures or informational documents in relation to this product. This warranty gives you specific legal rights, and you may also have other rights which vary from State to State.**

UV Resources (UVR) warrants to the original buyer that its Products shall be free from defects in material or workmanship under normal use and service for the periods of time set forth below. This warranty is contingent upon proper use of Products and will not apply if adjustment, repair or parts replacement is required because of an accident, unusual physical, electrical or electro-mechanical stress, neglect, misuse, failure of electric power, humidity control, transportation, unauthorized repair actions, or not installed or maintained in accordance with UVRs' specifications hereunder, or where Product serial numbers have been altered, defaced, or removed. UVRs' obligation under this warranty shall not arise until the Purchaser of the Product returns the defective part to UVR. This warranty is limited to the repair and/or replacement of parts. This warranty does not cover any labor or subsequent damage incurred as the result of Product failure or indirectly arising from the design, construction, installation, servicing, or operation of Products. UVR and its resellers' liability under this warranty shall in no event exceed the cost of goods sold under the original sale contract.

Under the conditions specified above, UV Resources warrants all DEF Product fixtures for a period of three (3) years from date of purchase and all lamps for a period of 12 months from date of installation provided lamps are installed within 3 months from date of purchase. Buyer must provide proof of purchase. This is UVR's sole warranty. No warranties are extended beyond those described herein and it is expressly agreed that this warranty will be in lieu of all warranties of fitness and merchantability. UVR neither assumes, nor authorizes any person to assume for it, any obligation in connection with the Products. **Buyer shall not return to UVR any allegedly defective goods without UVRs' prior written authorization.** This warranty may not be assigned or transferred.



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