

# ProMinent® Dulcodes UV Disinfection Systems

## General Information about UV Disinfection

Disinfection is an essential stage in modern water treatment. To an ever-increasing extent, UV disinfection is being used because it is a safe, chemical-free and reliable disinfection process.

In UV disinfection, the water to be treated is radiated with ultraviolet light. The whole process, therefore, is a purely physical and chemical-free means of water disinfection.

Short wave UV-C radiation (200-280 nm) has strong disinfecting properties, particularly radiation in the wavelength range of 240 to 280 nm.

The UV-C radiation directly attacks the life-critical DNA in bacteria. The radiation initiates a photochemical reaction in DNA and thereby destroys the heredity information contained within it. The bacteria loses its capacity to reproduce and is eradicated.

**The advantages of UV disinfection are manifold:**

- Immediate and reliable eradication of bacteria without the addition of chemicals.
- No THM or AOX production, no other undesirable by-products.
- No odor or taste effect on the water.
- No storage or handling of chemicals required.
- pH value is not affected by disinfection process.
- No reaction tank/period necessary.
- Low space requirement.
- Low investment and operating costs with high level of reliability and performance.

## Applications for Dulcodes UV Disinfection Systems

ProMinent® UV disinfection systems are used throughout the world for various applications.

- **Residential and Municipal water treatment** for the disinfection of drinking water.
- **Food and beverage industry** for the eradication of bacteria in water required for the production of food and beverage and for disinfection of process water.
- **Countering legionella in hot water systems.**
- **Unused ozone destruction without activated carbon.**
- **Pharmaceutical and cosmetics industry** for maintaining the high microbiological standards in production water.
- **Semi-conductor industry** for DOC reduction and maintaining the high microbiological standards in production water.
- **Reverse osmosis systems** for permeate disinfection.
- **Communal purification systems** for reducing the fouling rate in purification system drains; and for reducing the fouling rate in the process water extracted from the purification system
- **Air conditioning systems** for disinfecting the circulating water in humidifiers and cooling towers
- **Horticulture** for disinfecting watering water
- **Spa pools** for disinfecting pool water
- **Swimming pools** for chloramine decomposition in pool water

## ProMinent® UV Disinfection Systems

**ProMinent® Dulcodes UV Disinfection Systems comprise essentially:**

- High quality, bead blasted stainless steel radiation chambers (DIN 1.471 and/or ANSI 316 T1).
- Easily removable lamp protection tubes made of high grade quartz, connected on one side.
- High flux UV-C lamps with 4 pin ceramic plugs.
- Highly selective long term and temperature stable UVC sensors.
- UV system controllers and modern electronic ballasts built into a control cabinet.

# ProMinent® Dulcodes UV Disinfection Systems (cont.)

## Special feature of Dulcodes UV Disinfection Systems

The special features of our Dulcodes UV disinfection systems are:

- Even radiation of the entire water flow via the optimized system hydraulics, ensuring outstanding disinfection results.
- Optimized inflow.
- High turbulence longitudinal flow past UV radiation.
- Use of UV low-pressure lamps with long operating life and with high yield of UV-C of wavelength 254 nm (effective for disinfection).
- Use of the UV low pressure lamps with UV-C capacity largely unaffected by water flow.
- Individual lamp monitoring.
- System controller with extensive monitoring and indicating functions.
- Display of all important operating parameters and indication of failures in clear text, trend displays of actual progress of the UV sensor signal. By this means the lamp aging, deposition build-up on the lamp protection tubes or variation in the water quality can be easily monitored.
- Use of modern electronic ballasts with bus technology for gentle lamp ignition and operation. Ensures a long lamp operating life.
- Optional connection to the controller of automatic stop valve and an automatic flushing valve.

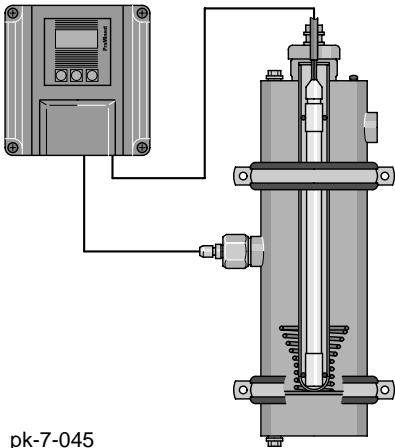
## ProMinent® - An Expert Partner In The Field of UV Disinfection

ProMinent® offers technical support to ensure the safe installation of a Dulcodes UV disinfection system:

- On site evaluation by trained, qualified service staff.
- System planning and design.
- Commissioning and system maintenance by our trained service technicians.

### ProMinent® UV Disinfection Systems

ProMinent® offers a variety of UV disinfection systems for various applications. The following is a partial list of our supply range.



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Dulcodes compact UV disinfection systems are used to disinfect drinking and industrial waters and can be used, depending on transmission, at flow rates from 4.4 to 17.6 gpm (1 to 4 m³/h).

The ballast and controller are contained in a compact housing. The controller has a contact output for connection to a stop valve or a fault-indicating device.

The systems have a high performance, calibratable UV sensor whose signal is displayed graphically. The display also gives the total number of operating hours and the number of times the lamps have been switched on.

This series incorporates standard low-pressure lamps with an operating life of 10,000 hours.

Dulcodes Type	Lamp power (W)	Supply power (W)	Length of radiation chamber in. (mm)	Minimum space avail. for lamp replacement in. (mm)	Diameter in. (mm)	Shipping weight/ operating weight approx. lbs (kg)	Nominal connector diameter in.
16P/11/3/4"	16	30	15.0 (382)	13.8 (350)	4.5 (114)	13-22 (6-10)	3/4
45P/11/5/4"	45	60	37.0 (940)	35.4 (900)	4.5 (114)	22-44 (10-20)	1-1/4

# ProMinent® Dulcodes

## UV Disinfection Systems (cont.)

### Dulcodes UV Disinfection Systems With High Flux Lamps

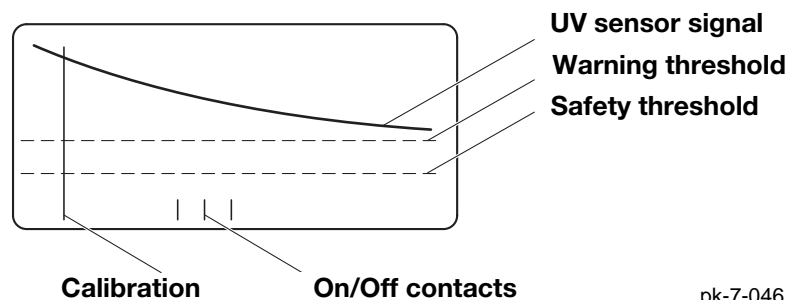
Dulcodes UV disinfection systems are used to disinfect drinking and industrial waters and can be used, depending on transmission, at flow rates from 22 to 1760 gpm (5 to 400 m<sup>3</sup>/h). Higher capacities are available on request.

This series uses very high-performance low-pressure lamps which minimizes the number of lamps required, enabling the radiation chambers to have a compact design. These high-performance lamps have an operating life of 8,000 - 10,000 hours.

The ballasts are equipped with a BUS interface via which the lamps are ignited and monitored to ensure correct burning. The lamp current can be varied via the BUS interface, permitting a gentle ignition process and precise adjustment to the optimum lamp operating current. The lamp current can thereby be increased slightly at very cold water temperatures <36°F (<8°C). In the case of systems with multiple lamps, individual lamps are monitored via the BUS interface. Should a lamp fail, the stop valve will close.

Dulcodes UV systems are fitted with a long term-stable UVC sensor to monitor the disinfection capacity of the lamps and to monitor the transmission (UV admission) of the water.

The UV system controller incorporates a large graphic display showing the sensor signal. This trend display indicates lamp aging, scale on the lamp protection tube or changes in the water quality within a time window. Horizontal lines indicate safety and warning thresholds.



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After starting the UV system, the flushing valve opens for the initial flushing phase once the UVC capacity has exceeded the safety threshold. After the initial phase the stop valve opens automatically.

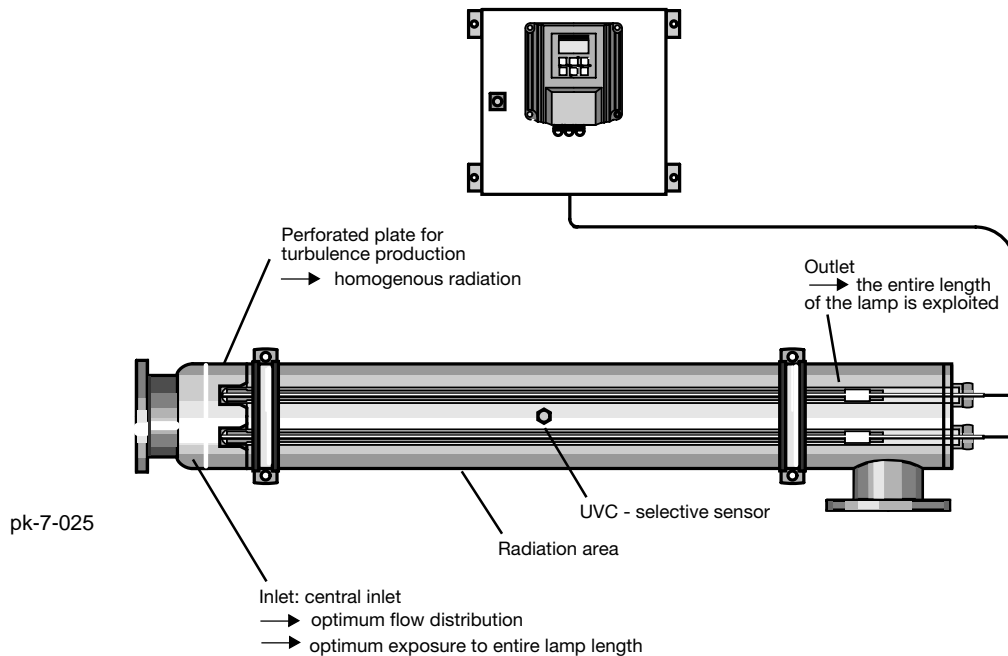
A warning signal is given if the UVC capacity falls below the warning threshold during normal operation. If the UVC capacity falls below the safety threshold, the stop valve closes and the flushing valve opens.

Dulcodes UV disinfection systems also incorporate a variable free flushing phase. If the UVC capacity rises again within a certain time the system recommences normal operation.

# ProMinent® Dulcodes UV Disinfection Systems (cont.)

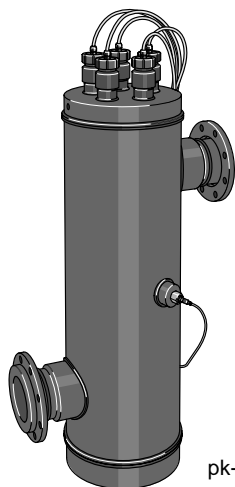
## Dulcodes UV Disinfection Systems With High Flux Lamps

Dulcodes Type	Lamp power (W)	Supply power (W)	Length of radiation chamber in. (mm)	Minimum space avail. for lamp replacement in. (mm)	Diameter in. (mm)	Shipping weight/ operating weight approx. lbs (kg)	Nominal connector diameter in.
80W/11/5/4"	80	100	24.8 (630)	23.6 (600)	4.5 (114)	18-31 (8-14)	1-1/4
130W/11/2"	130	150	37.0 (940)	35.4 (900)	4.5 (114)	22-44 (10-20)	2
230W/130/DN 65	230	250	58.5 (1486)	55.1 (1400)	5.5 (140)	53-101 (24-46)	2-1/2
2*230W/21/DN 125	2*230	500	64.6 (1640)	59.1 (1500)	8.7 (220)	90-212 (41-96)	5
3*230W/27/DN 150	3*230	750	65.6 (1665)	59.1 (1500)	10.7 (273)	117-304 (53-138)	6
4*230/32/DN 200	4*230	1000	66.5 (1690)	63.0 (1600)	12.8 (324)	143-331 (65-150)	8
5*230W/32/DN 200	5*230	1200	66.5 (1690)	63.0 (1600)	12.8 (324)	154-419 (70-190)	8
6*230W/32/DN 200	6*230	1400	70.5 (1790)	63.0 (1600)	16.0 (406)	165-441 (75-200)	8
7*230W/40/DN 250	7*230	1700	75.6 (1920)	63.0 (1600)	16.0 (406)	254-683 (115-310)	10
8*230W/40/DN 250	8*230	1900	75.6 (1920)	63.0 (1600)	16.0 (406)	254-683 (115-310)	10
9*230W/40/DN 250	9*230	2100	75.6 (1920)	63.0 (1600)	16.0 (406)	287-705 (130-320)	10
10*230W/40/DN 250	10*230	2400	75.6 (1920)	63.0 (1600)	16.0 (406)	287-705 (130-320)	10
11*230W/40/DN 250	11*230	2600	75.6 (1920)	63.0 (1600)	16.0 (406)	287-705 (130-320)	10
12*230W/40/DN 250	12*230	2800	75.6 (1920)	63.0 (1600)	16.0 (406)	287-705 (130-320)	10



# ProMinent® Dulcodes UV Disinfection Systems (cont.)

## Custom Versions of the Dulcodes UV Disinfection System



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Dulcodes, Type K

ProMinent offers a wide range of custom versions of the Dulcodes UV disinfection system:

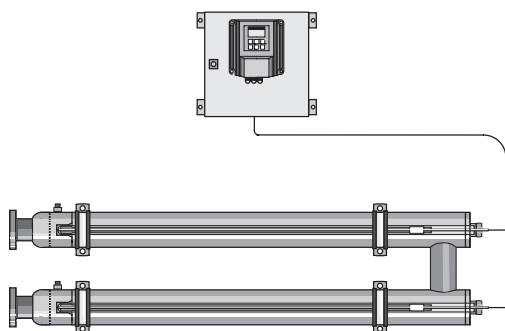
The K series is used for the disinfection of salt waters (thermal water, brine). Its radiation chambers are made of high-performance plastic and special welding processes ensure optimum pressure-resistance (can be used up to operating pressures of 58 psi (4 bar).

Typical applications include the disinfection of filter back washing water in brine swimming pools or to reduce deposition on the input side of reverse osmosis systems in systems used to reclaim drinking water from brine.

This series covers flow rates from 31 to 396 gpm (7 to 90 m<sup>3</sup>/h) (at transmission value 90% and a dose of 400 J/m<sup>2</sup>). Larger flow rates can be accommodated on request.

Dulcodes Type	Lamp power (W)	Supply power (W)	Length of radiation chamber in. (mm)	Minimum space avail. for lamp replacement in. (mm)	Diameter in. (mm)	Shipping weight/operating weight approx. lbs (kg)	Nominal connector diameter in. (DN)
1*130K/12/DN 50	1*130	150	54 (1371)	55.1 (1400)	4.9 (125)	26-40 (12-18)	2 (50)
2*130K/28/DN 100	2*130	280	54 (1371)	55.1 (1400)	11.0 (280)	84-172 (38-78)	4 (100)
3*130K/28/DN 100	3*130	420	54 (1371)	55.1 (1400)	11.0 (280)	88-172 (40-78)	4 (100)
4*130K/40/DN 150	4*130	550	54 (1371)	55.1 (1400)	15.7 (400)	106-353 (48-160)	6 (150)
5*130K/40/DN 150	5*130	680	54 (1371)	55.1 (1400)	15.7 (400)	110-353 (50-160)	6 (150)
6*130K/40/DN 150	6*130	810	54 (1371)	55.1 (1400)	15.7 (400)	115-353 (52-160)	6 (150)

The D series is ideal for the disinfection of waters containing a high level of dissolved solids, or colored industrial or wastewater. Its radiation chambers are designed as thin-layer systems and cover flow rates from 4.4 to 132 gpm (1 to 30 m<sup>3</sup>/h) (at transmission value 70 and a dose of 400 J/m<sup>2</sup>).



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Additional custom versions already in use:

- For pharmaceutical use: ProMinent offers electro-polished custom versions of the UV disinfection system with particularly fine surface finish <0.031 in. (<0.8 mm).
- UV systems for the decomposition of chloramines in swimming pool water are an alternative to metering powdered carbon or an ozonating stage.
- UV systems for unused ozone destruction and the decomposition of chlorine or chlorine dioxide are an alternative to using an activated carbon filter.
- UV systems for TOC decomposition in super-clean water with special lamps.

# ProMinent® Dulcodes UV Disinfection Systems (cont.)

## Custom Versions of the Dulcodes UV Disinfection System

Dulcodes Type	Lamp power (W)	Supply power (W)	Length of radiation chamber in. (mm)	Minimum space avail. for lamp replacement in. (mm)	Diameter in. (mm)	Shipping weight/ operating weight approx. lbs (kg)	Nominal connector diameter in. (DN)
45D/9/1"	45	60	37 (940)	35.4 (900)	3.5 (89)	22-33 (10-15)	1"
130D/9/1"	130	150	37 (940)	35.4 (900)	3.5 (89)	22-33 (10-15)	1"
1*230D/9/DN 65	1*230	250	59 (1500)	55.1 (1400)	3.5 (89)	40-55 (18-25)	2-1/2 (65)
2*230D/9/DN 65	2*230	500	59 (1500)	55.1 (1400)	3.5 (89)	79-110 (36-50)	2-1/2 (65)
3*230D/9/DN 66	3*230	750	59 (1500)	55.1 (1400)	3.5 (89)	119-165 (54-75)	2-1/2 (65)
4*230D/9/DN 66	4*230	1000	59 (1500)	55.1 (1400)	3.5 (89)	159-220 (72-100)	2-1/2 (65)

# ProMinent® Dulcodes

## The Design of a UV Disinfection System

### Questionnaire for the Design of a UV Disinfection System

Project/Date \_\_\_\_\_

Client \_\_\_\_\_

Correspondent \_\_\_\_\_

#### Application of disinfected water

- |  |   |
|--|---|
| <input type="checkbox"/> Drinking water (private water supply)                         | <input type="checkbox"/> Drinking water (mains water supply)                |
| <input type="checkbox"/> Drinking water (hot water supply)                             | <input type="checkbox"/> Production water in the food and drinks industries |
| <input type="checkbox"/> Production water in the pharmaceutical or cosmetic industries | <input type="checkbox"/> Ultrapure water                                    |
| <input type="checkbox"/> Ventilation and air conditioning plant                        | <input type="checkbox"/> Horticultural watering system                      |
| <input type="checkbox"/> Fish farming  | <input type="checkbox"/> Operation water in sewage plant                    |
| <input type="checkbox"/> Other _____   |   |

#### Source of water to be disinfected

- |  |   |
|--|---|
| <input type="checkbox"/> Main water supply | <input type="checkbox"/> Well                         |
| <input type="checkbox"/> Spring            | <input type="checkbox"/> Surface ground water         |
| <input type="checkbox"/> Rain water        | <input type="checkbox"/> Reverse osmosis              |
| <input type="checkbox"/> Sea water         | <input type="checkbox"/> Wastewater from sewage plant |
| <input type="checkbox"/> Circulating water |   |
| <input type="checkbox"/> Other _____       |   |

#### Raw water pre-treatment

- |   |  |
|---|--|
| <input type="checkbox"/> Sand filtration    | <input type="checkbox"/> Flocculation filtration |
| <input type="checkbox"/> Micro filtration   | <input type="checkbox"/> Softening               |
| <input type="checkbox"/> Iron removal       | <input type="checkbox"/> Manganese removal       |
| <input type="checkbox"/> Total desalination |  |
| <input type="checkbox"/> Dosing with _____  |  |
| <input type="checkbox"/> Other _____        |  |

#### Maximum water flow limited

- |   |  |
|---|--|
| <input type="checkbox"/> by pump capacity | <input type="checkbox"/> by yield of well    |
| <input type="checkbox"/> by restrictor    | <input type="checkbox"/> by sampling station |
| <input type="checkbox"/> Other _____      |  |

# ProMinent® Dulcodes

## The Design of a UV Disinfection System

### Questionnaire for the Design of a UV Disinfection System

#### Design of UV disinfection system

Maximum water flow \_\_\_\_\_ gpm (m<sup>3</sup>/h)

Minimum UV transmission at 254 nm \_\_\_\_\_ % /1 cm \_\_\_\_\_ % /10cm \_\_\_\_\_ SAK 254 nm

Exposure dose at the end of the lamp operating life ☐ 300 J/m<sup>2</sup> ☐ 400 J/m<sup>2</sup>  
☐ \_\_\_\_\_ J/m<sup>2</sup> ☐ unused ozone removal

Water temperature ☐ 37 - 104°F (3 - 40°C) ☐ 104 - 167°F (40 - 75°C) ☐ \_\_\_\_\_ to \_\_\_\_\_ °F (°C)  
☐ "Steam resistant" option

Operating pressure ☐ PN 10 (standard version) ☐ PN \_\_\_\_\_

Connector ☐ Standard connector (see technical documentation)  
☐ Flange in. (DN) \_\_\_\_\_ ☐ Pipe thread \_\_\_\_\_ inch  
☐ Other connection \_\_\_\_\_

Water analysis ☐ Supplied ☐ Will be supplied later

#### System design

Radiation chamber material

- ☐ Standard version in stainless steel (see technical documentation)  
☐ Chloride-resistant stainless steel, chloride \_\_\_\_\_ mg/L  
☐ Other \_\_\_\_\_

Radiation chamber version (see also system designs)

- ☐ Standard version (see technical documentation)  
☐ Version A ☐ Version B ☐ Version C ☐ Version D ☐ Version E ☐ Version F  
 Power supply ☐ 230 V ☐ 400 V ☐ \_\_\_\_\_ V ☐ 50 Hz ☐ 60Hz  
 Controller ☐ At control cabinet (standard version)  
☐ Away from control cabinet, desired distance \_\_\_\_\_ ft. (m)

☐ The following directives and regulations etc. must be adhered to \_\_\_\_\_  
 \_\_\_\_\_

☐ The following additional documentation is also required \_\_\_\_\_  
 \_\_\_\_\_



# ProMinent® Dulcodes

## The Design of a UV Disinfection System

### Questionnaire for the Design of a UV Disinfection System

Project / Date \_\_\_\_\_

Water quality ☐ Constant ☐ Fluctuating

Total hardness \_\_\_\_\_ mmol/L \_\_\_\_\_ °dH or mgCaCO<sub>3</sub>/L \_\_\_\_\_

Carbonate hardness \_\_\_\_\_ mmol/L \_\_\_\_\_ °dH or mgCaCO<sub>3</sub>/L \_\_\_\_\_

Chloride \_\_\_\_\_ mg/L

Manganese \_\_\_\_\_ mg/L

Iron \_\_\_\_\_ mg/L

Potassium permanganate consumption \_\_\_\_\_ mg/L

Appearance ☐ Clear ☐ Cloudy ☐ Colored ☐ \_\_\_\_\_

UV transmission at 254 nm \_\_\_\_\_ % / 1 cm

\_\_\_\_\_ % / 10 cm

\_\_\_\_\_ SAK 254 nm

Opacity \_\_\_\_\_ FTU

Suspended solids content 72°F (22°C) \_\_\_\_\_ mg/L

Total colony count 72°F (22°C) \_\_\_\_\_ cfu/mL (colony forming units mL)

Total micro-biological count 99°F (37°C) \_\_\_\_\_ cfu/mL (colony forming units mL)

Coliforms \_\_\_\_\_ cfu/mL (colony forming units mL)

Parasites ☐ Present ☐ Not Present

Algae ☐ Present ☐ Not Present

☐ Comments \_\_\_\_\_  
\_\_\_\_\_