# Watercooled RF Power Pot Capacitors
# Internal Cooling System



| QUICK REFERENCE DATA | | | |
|---|---|---|---|
| DESCRIPTION | VALUE | | |
| Ceramic Class | 1 | | |
| Ceramic Dielectric | R42, R85 | | |
| Type | TWIF 085215 | TWIF 085175 | TWIF 085260 |
| Voltage (Vp) | 14 000 | 14 000 | 14 000 |
| Min. Capacitance (pF) | 1000 | 2200 | 4700 |
| Max. Capacitance (pF) | 1000 | 2200 | 4700 |
| Mounting | Screw terminal | | |

## PRODUCT DESCRIPTION

TWIF pot-styled capacitors dissipate the heat produced under load by means of water flow around the capacitor elements. In order to provide protection from influences of the chemical / physical characteristics of the coolant, a glass passivation layer is applied over the cooled inner noble metal electrode.

The electrical terminations are made directly to the noble metal electrodes either utilizing special soldering techniques or special clamping fittings. This method of attachment provides a strong, rigid connection of unsurpassed reliability. The TWIF pot-styled capacitors feature an umbrella shaped insulating rim made from silicone elastomer to minimize the adverse effects of moisture, dust and other impurities in the working environment and to improve the characteristics of the electrical field. The capacitor body is protective lacquered.

## MARKING

Type designator, capacitance value and tolerance, rated RF voltage, ceramic material code, production date code, manufacturer logo, serial number.

## ACCESSORIES ADDED

All watercooled pot capacitors are supplied with the necessary ferrules and 10 mm tube fittings for the water supply connections.

## FEATURES

- High voltage, current and power ratings
- Compact design reduces terminal self inductance and permit operation up to higher frequencies
- These pot capacitors feature increased density through watercooling and rugged mechanical construction for a maximum reliability

## APPLICATIONS

Watercooled RF power pot capacitors are designed for use in the tank circuit of high power RF equipment such as induction heating and welding equipment, dielectric heating or a variety of specialized RF applications.

## CAPACITANCE RANGE

1.0 nF to 4.7 nF

## CAPACITANCE TOLERANCE

± 20 %

## CERAMIC DIELECTRIC

- R42 (TCC - 250 ppm/K)
- R85 (TCC - 750 ppm/K)

## RATED VOLTAGE

14 $kV_p$

## DIELECTRIC STRENGTH TEST

200 % of rated voltage, 50 Hz

## RF POWER TEST

140 % to 180 % of rated power, for 10 minutes in a test generator circuit

## DISSIPATION FACTOR

Max. 0.05 %

Measuring frequencies:
300 kHz or 100 kHz

## INSULATION RESISTANCE

Min. 10 000 MΩ (at 25 °C)

## OPERATING TEMPERATURE RANGE

Details of watercooling find under “Guidelines”, next pages



For technical questions, contact: powcap@vishay.com

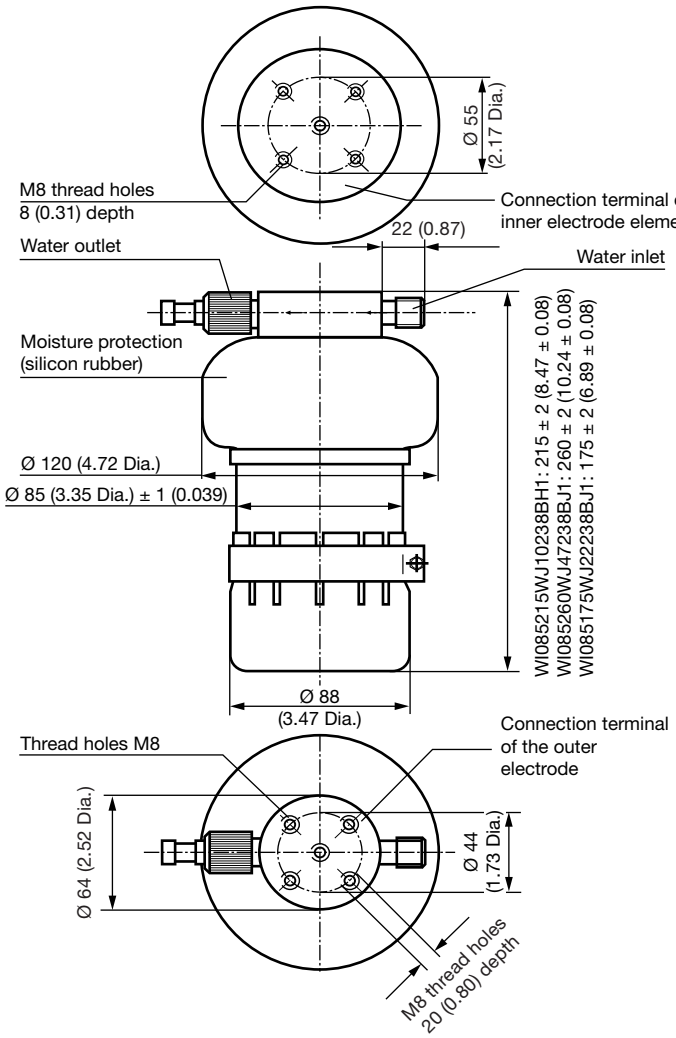
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## SAP PART NUMBER AND ELECTRICAL DATA

| PART NUMBER | CERAMIC | CAP. VALUES (pF) | RATED VOLTAGE ($kV_p$) | RATED POWER (kvar) | RATED CURRENT ($A_{RMS}$) | MIN. WATER FLOW RATE PER MINUTE (Liter / US-gal.) |
|---|---|---|---|---|---|---|
| WI085215WJ10238BH1 | R42 | 1000 | 14 | 1500 | 200 | 3.7 / 1.0 |
| WI085175WJ22238BJ1 | R85 | 2200 | | | | 3.7 / 1.0 |
| WI085260WJ47238BJ1 | | 4700 | | | | 4.5 / 1.2 |

## DIMENSIONS in millimeters (inches)

**Installation position:**
These capacitors are designed to be installed in a vertical position, connection fittings of the water cooling system upside.
Horizontal installation position is permissible, whereby the water-outlet must be on top-side.

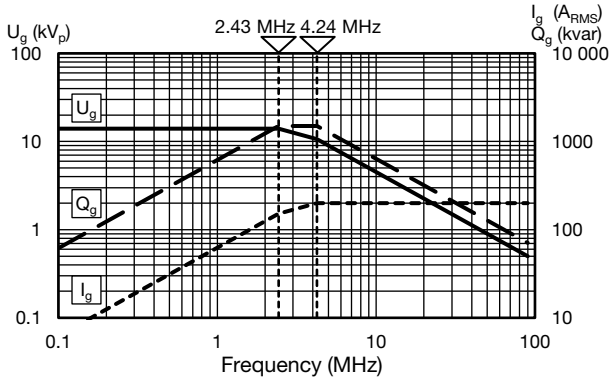




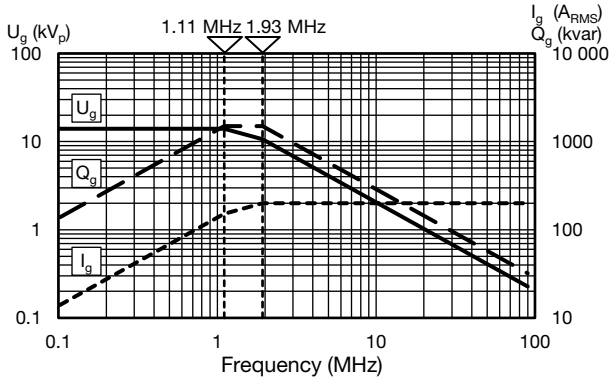
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## DERATING DIAGRAMS

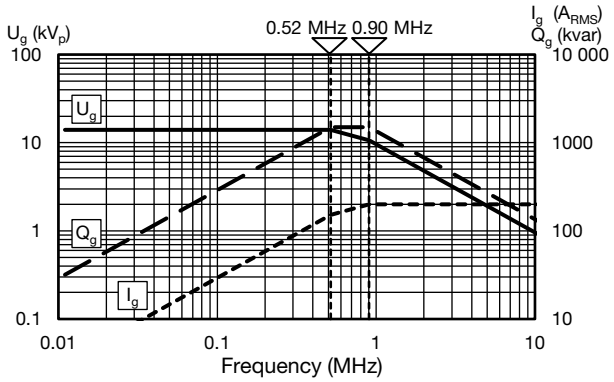
**WI085215WJ10238BH1**




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## GUIDELINES

### ELECTRICAL DATA AND GUIDELINES

- The main physical and electrical characteristics of the capacitors and ceramic materials used, are listed in the tables on the general section and in the individual datasheets.
- The continuous limit values of voltage, current, and power given in the diagrams must be observed.
- The rated voltage given in the tables is the peak value of the sinusoidal AC voltage or the sum of the DC and peak AC voltages for which the capacitor is rated under continuous operation.
- The rated current in the tables is the effective value of the sinusoidal current for which the current paths of the capacitor are designed.

### INSTALLATION

- Watercooled pot capacitors (TWIF 085175, TWIF 085215, TWIF 085260) are designed to be installed in a vertical position, connection fittings of the watercooling system upside. For large generators requiring multiple capacitors we recommended a circular mounting pattern for optimum circuit performance.
- When capacitors are connected in parallel, care should be taken to mount the top electrodes of the capacitor away from the RF bus bar to minimize the effects of stray electromagnetic fields. The capacitors elements must not exceed a temperature of more than +100 °C.
- The electrical connection to the inner electrode must be flexible in order to prevent the generation of physical forces which could damage the capacitor elements. Such forces are often generated by the dimensional differences resulting from the normal physical tolerances of the capacitors. The capacitor's inner electrode connector must not be used as a mechanical support for other devices or components.

### COOLING

- The cooling system is designed to operate at a maximum water pressure of 4 bars (58 psi).
- The position of water inlet and outlet is designed to be installed in a vertical position, connection fittings of the watercooling system top-side. This allows any air to escape from the unit.
- The minimum water flow rates specified in the tables must be observed. When using antifreeze mixtures, the flow rate should be increased by at least 20 %.
- The cooling system is designed to have a water temperature increase of < 10 °C (water inlet to water outlet) when the capacitor is operated at full rated power and the minimum water flow rate. A water intake temperature of ≤ 30 °C is recommended. If the cooling system of several capacitors is connected in series, the intake temperature of the coolant must not exceed 50 °C for any capacitors.
- The pressure drop in a series connected cooling system is small. The table below illustrates the effects upon water flow rates as a function of the number of series connected typical watercooled capacitors in the system with a constant intake water pressure of 3 bars (43.5 psi).

| Number of cooling systems in series | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Water flow rate (liters/minute) | 13.0 | 10.5 | 8.5 | 7.3 |
| Water flow rate (US-gal./minute) | 3.43 | 2.77 | 2.24 | 1.92 |

- Intake water temperature fluctuations in excess of 3 °C/s must be avoided to prevent damage to the capacitor elements.
- A coolant temperature rate monitor must provide a fail-safe on / off power control for the RF equipment.
- Normal tap water or de-mineralized water may be used for cooling. The water must be reasonably free of Ca $CO_3$ and clear of foreign particles or milkyness. The pH-value of the coolant should between 6 and 8.


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## QUALITY AND RELIABILITY

### ELECTRICAL AND MECHANICAL SCREENING TESTS

All capacitors are subjected to the following tests prior to shipment

- Capacitance value (1.0 MHz or 0.1 MHz, 20 $V_{RMS}$, 25 °C ± 5 °C)
- Dissipation factor (1.0 MHz or 0.3 MHz, 10 $V_{RMS}$, 25 °C ± 5 °C)
- Insulation resistance (100 $V_{DC}$, 25 °C ± 5 °C)
- Dielectric strength (200 % rated peak voltage, 50 Hz, 5 minutes)
- RF power test (140 % to 180 % rated power for 10 minutes in a test generator circuit)
- Pressure test (standard: 6 bars [87 psi] for 1 minute, 25 °C ± 5 °C)

### WARRANTY STIPULATION FOR WATERCOOLED CERAMIC POWER RF CAPACITORS

- Unless otherwise provided for hereinafter, warranty shall be governed by General Terms of Sale and Delivery.
- Warranty is assumed for capacitors which fail to operate owing to faults in material or production, and within the warranty period for capacitors.
- Excluded from warranty are capacitors prematurely rendered unserviceable owing to improper treatment, overloading, circuit errors, as well as capacitors operated without observing the data given in our catalogue. Warranty is also excluded in cases where faults can no longer be recognized on the capacitor owing to third party interferences. Warranty is only effectively assumed when meeting the requirements referred to hereinafter.
- For claiming warranty, the defective capacitor should be returned to us, if possible in its original packing, within 14 days following the data of failure, being accompanied by the completely filled-in and signed Original Guarantee Certificate. The risks of transportation, as well as any shipping costs and other charges shall in any case be borne by the sender.
- Warranty can only become effective if the defective capacitor is received by us in the same condition as it was when it happened to fail.
- We have the right to inspect any records proving the use of the capacitor.
- The decision as to whether we are obliged to assume warranty for the capacitor shall exclusively rest with us.
- When acknowledging the warranty claim, any non-repairable capacitor shall remain our property. When refusing a warranty claim the defective capacitor will be returned at the customer's expense only if demanded so explicitly when asserting the warranty claim. In case examination required disassembly of the capacitor no claims for damage can be derived therefrom.
- The customer gives us the right to have the system checked in which the capacitor was operated.
- When acknowledging a warranty claim, restitution is made by supplying either a repaired and newly tested capacitor or by supplying a new one.
- Warranty shall only extend to the capacitor itself. Any further claims for damages are excluded.

### CONDITIONS OF GUARANTEE

Pursuant to the foregoing stipulations we assume warranty for these watercooled pot capacitors up to a period of 5000 hours of operating service. Any claims for warranty, however will extinguish 24 months following the date of delivery.

| RELATED DOCUMENTS | |
|---|---|
| General Information | www.vishay.com/doc?22071 |


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