

## Ultra Low Profile Steel Heaters

### WSHR Series

- Ultra low profile conduction heater
- 400°C continuous operating temperature
- Uniform temperature distribution
- Low thermal mass for rapid dynamic response
- Ideal for chemical & food process, sealing & printing, scientific & medical thermal control applications
- Single fixing mountable with three termination options
- RoHS compliant, non-flammable construction



All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

## Electrical & Thermal Data

| Size Code | Approx. Size (mm) | Rating Code | Rated Voltage (Vrms) | Power ±10% (W) | Power Density ±10% (W/cm <sup>2</sup> ) | Nominal Resistance ±10% (Ω) | Dielectric Voltage (V dc or ac peak) |
|-----------|-------------------|-------------|----------------------|----------------|-----------------------------------------|-----------------------------|--------------------------------------|
| 1/2       | 32 X 28           | 47RK        | 120                  | 306            | 34.2                                    | 47                          | 2500                                 |
|           |                   | 100RK       | 120                  | 144            | 16.1                                    | 100                         |                                      |
| 1         | 49 x 36           | 22RK        | 120                  | 655            | 37.1                                    | 22                          |                                      |
|           |                   | 47RK        | 120                  | 306            | 17.4                                    | 47                          |                                      |
|           |                   | 100RK       | 240                  | 576            | 32.7                                    | 100                         |                                      |
| 2         | 61 x 41           | 150RK       | 240                  | 384            | 21.8                                    | 150                         |                                      |
|           |                   | 22RK        | 120                  | 655            | 26.2                                    | 22                          |                                      |
|           |                   | 47RK        | 120                  | 306            | 12.3                                    | 47                          |                                      |
| 3         | 102 x 70          | 100RK       | 240                  | 576            | 23.0                                    | 100                         |                                      |
|           |                   | 150RK       | 240                  | 384            | 15.4                                    | 150                         |                                      |
|           |                   | 22RK        | 120                  | 655            | 9.2                                     | 22                          |                                      |
| 5         | 122 x 70          | 47RK        | 120                  | 306            | 4.3                                     | 47                          |                                      |
|           |                   | 100RK       | 240                  | 576            | 8.1                                     | 100                         |                                      |
|           |                   | 150RK       | 240                  | 384            | 5.4                                     | 150                         |                                      |
| 7         | 152 x 102         | 22RK        | 120                  | 655            | 7.7                                     | 22                          |                                      |
|           |                   | 47RK        | 120                  | 306            | 3.6                                     | 47                          |                                      |
|           |                   | 100RK       | 240                  | 576            | 6.7                                     | 100                         |                                      |
|           |                   | 150RK       | 240                  | 384            | 4.5                                     | 150                         |                                      |
|           |                   | 47RK        | 240                  | 1226           | 7.9                                     | 47                          |                                      |
|           |                   | 100RK       | 240                  | 576            | 3.7                                     | 100                         |                                      |
|           |                   | 150RK       | 240                  | 384            | 2.5                                     | 150                         |                                      |

The internal thermal impedance between the resistive glaze element and the heatsink-facing surface is <0.15°C/W for all sizes.

The heat capacities and thermal time constants for each size are as follows:

| Size Code | Heat Capacity, typical (J/K) | Thermal Time Constant, typical, cooling unmounted in still air (s) |
|-----------|------------------------------|--------------------------------------------------------------------|
| 1/2       | 2.9                          | 75                                                                 |
| 1         | 5.3                          | 125                                                                |
| 2         | 7.3                          | 175                                                                |
| 3         | 22                           | 220                                                                |
| 5         | 44                           | 280                                                                |
| 7         | 80                           | 420                                                                |

### General Note

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## Physical Data

| Dimensions in mm, weight without terminations in g |        |        |        |        |       |       |       |         |
|----------------------------------------------------|--------|--------|--------|--------|-------|-------|-------|---------|
|                                                    | L ±0.1 | W ±0.1 | t ±0.1 | ∅D nom | a nom | b nom | c nom | Wt. nom |
| WSHR1/2                                            | 31.9   | 28.1   | 0.9    | 2.2    | 7.5   | 3.1   | 4.3   | 6.5     |
| WSHR1                                              | 49.3   | 35.9   |        | 3.2    | 3.2   | 11.2  | 6.2   | 12.6    |
| WSHR2                                              | 61     | 40.6   |        | 4.7    | 13.0  | 5.8   | 17.1  |         |
| WSHR3                                              | 101.6  | 70     | 1.5    | 5.3    | 13.5  | 22.0  | 10.2  | 50.8    |
| WSHR5                                              | 122    | 70     |        |        | 14.0  | 23.8  | 7.4   | 101.2   |
| WSHR7                                              | 152.4  | 101.6  |        |        | 15.0  | 51.3  | 9.2   | 181.8   |



Fixing hole is located centrally except on WSHR1/2 where the dimension from the edge by the terminations to the mounting hole centre is 16.68mm.

In addition to the central fixing hole, WSHR7 has two corner holes. These are present for manufacturing purposes only and should not be used as fixing holes.

## Construction

A high integrity dielectric layer is applied to a machined stainless steel substrate. Thick-film conductor and element patterns are printed and fired, then protected with a high temperature overglaze. The termination pads are tinned with Pb-free solder and optional terminals or leads are soldered on.



## Terminations

The following termination options are available

| Option                                | Code | Nominal Dimensions (mm) |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |
|---------------------------------------|------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------|---|----------------|---------------------|-----|-----|--------------------|-----|-----|------------------------|-----|-----|
| Solder pad only                       | I    |                         | <table border="1"> <tr> <td>WSHR Size</td> <td>½</td> <td>1, 2, 3, 5 &amp; 7</td> </tr> <tr> <td>Pad Length, PL</td> <td>7.5</td> <td>9.0</td> </tr> <tr> <td>Pad Width, PW</td> <td>4.5</td> <td>9.0</td> </tr> </table>                                                                               |   | WSHR Size      | ½ | 1, 2, 3, 5 & 7 | Pad Length, PL      | 7.5 | 9.0 | Pad Width, PW      | 4.5 | 9.0 |                        |     |     |
|                                       |      |                         | WSHR Size                                                                                                                                                                                                                                                                                               | ½ | 1, 2, 3, 5 & 7 |   |                |                     |     |     |                    |     |     |                        |     |     |
| Pad Length, PL                        | 7.5  | 9.0                     |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |
| Pad Width, PW                         | 4.5  | 9.0                     |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |
| Flying leads<br>UL3134/5 40A,<br>600V | L    |                         |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |
| Push-on connectors                    | T    |                         | <table border="1"> <tr> <td>WSHR Size</td> <td>½</td> <td>1, 2, 3, 5 &amp; 7</td> </tr> <tr> <td>Terminal Height, TH</td> <td>7.5</td> <td>12</td> </tr> <tr> <td>Terminal Width, TW</td> <td>2.8</td> <td>6.3</td> </tr> <tr> <td>Terminal Thickness, TT</td> <td>0.8</td> <td>0.8</td> </tr> </table> |   | WSHR Size      | ½ | 1, 2, 3, 5 & 7 | Terminal Height, TH | 7.5 | 12  | Terminal Width, TW | 2.8 | 6.3 | Terminal Thickness, TT | 0.8 | 0.8 |
|                                       |      |                         | WSHR Size                                                                                                                                                                                                                                                                                               | ½ | 1, 2, 3, 5 & 7 |   |                |                     |     |     |                    |     |     |                        |     |     |
| Terminal Height, TH                   | 7.5  | 12                      |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |
| Terminal Width, TW                    | 2.8  | 6.3                     |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |
| Terminal Thickness, TT                | 0.8  | 0.8                     |                                                                                                                                                                                                                                                                                                         |   |                |   |                |                     |     |     |                    |     |     |                        |     |     |

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WSHR Series

## Application Notes

For optimum thermal transfer to the heated surface, sufficient thermal grease (e.g. Dow Corning DC340) to give void-free coverage, or a 0.5mm thick compliant thermal pad (e.g. T Global TG-X) should be used. The heated surface should have a finish of <math><6.3\mu\text{m}</math> with flatness of <math><0.05\text{mm}</math>. The heater should be mounted using an appropriate bolt as listed in the table below. This should be tightened so as to bring the whole area of the steel substrate into intimate contact with the heatsink. The unmounted part is slightly bowed so that the centre is above the edges. Inadequate tightening will leave the centre out of contact with the heatsink, whilst over tightening can cause the edges to rise. The tightening torque required will depend on the fixings and heatsink used, but typical figures are given for guidance.

|         | Bolt Size | Typical Tightening Torque (Nm) |
|---------|-----------|--------------------------------|
| WSHR1/2 | M2        | 0.6                            |
| WSHR1   | M3        | 2                              |
| WSHR2   | M5        | 2.5                            |
| WSHR3   | M5        | 2.5                            |
| WSHR5   | M5        | 3.5                            |
| WSHR7   | M5        | 4                              |

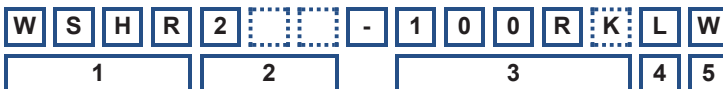
WSHR heaters will fail safe (open circuit) under overload fault conditions and still maintain a 1kV dielectric withstand.

WSHR heaters may be customised in various ways including:

- Alternative shapes and dimensions up to 406mm x 406mm
- Non-uniform thermal profiles
- Integration of temperature measurement or regulation elements
- Alternative voltage and power ratings

## Ordering Procedure

**Example: WSHR2-100RK L W** (WSHR in 61 x 41mm size and 576W at 240V rating with flying leads, Pb-free)



| 1      | 2    | 3      | 4           |                    | 5       |                                     |      |         |
|--------|------|--------|-------------|--------------------|---------|-------------------------------------|------|---------|
| Series | Size | Rating | Termination |                    | Packing |                                     |      |         |
| WSHR   | 1/2  | 22RK   | I           | Solder pad only    | W       | 1/2-I                               | Bulk | 180/box |
|        | 1    | 47RK   | L           | Flying leads       |         | 1/2-T                               |      | 64/box  |
|        | 2    | 100RK  | T           | Push-on connectors |         | 1/2-L, 1-L, 2-L, 3-I, 3-T, 5-I, 5-T |      | 40/box  |
|        | 3    | 150RK  |             |                    |         | 1-I, 2-I                            |      | 100/box |
|        | 5    |        |             |                    |         | 1-T, 2-T                            |      | 80/box  |
|        | 7    |        |             |                    |         | 3-L, 5-L, 7                         |      | 20/box  |
|        |      |        |             |                    |         |                                     |      |         |

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