Zoppas Industries
Heating Element Technologies

# TUBULAR FOR PROFESSIONAL DISHWASHERS

Standardization of tubular heaters for water heating in industrial dishwashers is the synthesis of the expertise gathered by ZIHET in several years of market leadership.
The project criteria that drive the design of each heater rely on performance, reliability and durability at same time taking into account the standard requirements of the market. All resulted in a catalog including both single-phase and three-phase models, ranging from 2.000W to 12.000W.
In its working condition, the heating element is immersed in a water tank and fixed with a flange: the catalogue includes the most diffused stainless flange dimensions as well a range of lengths for the heating element to fit the most common water tank.

## Technical facts of standard heaters

| | | |
|---|---|---|
| Working environment | Immersed in water | |
| Sheath material | Incoloy 800 | |
| Voltage | 230V | |
| Power rates | 2000÷3000W (single-phase) | 3000÷12000W (three-phase) |
| Maximum power density | 16 W/cm$^2$ | |
| Heater sheath diameter | Ø6,25 mm (single-phase) | Ø8,5 mm (single-phase) |
| Number of elements | 1 element | 3 elements |
| Shape |  Refolded |  U-shape |
| Flange | Ø47 mm | Ø57 mm |
| Connectors | 6,3 x 0,8 mm faston | 6,3 x 0,8 mm double faston |
| Connector jumper | Not applicable | Not available |
| Thermostat | Not available | |
| Thermostat pocket | Incoloy 800 Ø 8,5 mm | |
| Thermal link | Not available | Not included |

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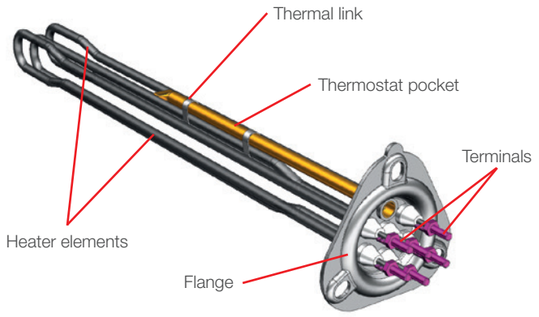
## The heating element

The core of each heating element is the rod that is made of the commonly used Incoloy-800, a material with a great resistance to oxidation, carburization and sulfidation. Most important for the purpose of dishwasher, it also feature resistance to corrosion by water. The ends of the rods are hermetically sealed to guarantee the dielectric proprieties over the time. Several test are 100% performed throughout the manufacturing process in order to assess the total quality of each selected product. Electrical test and pneumatic test, for instance, assess the compliance to the design ohmic value and to waterproofness.

## Options

Depending on installation layout and on the power supply, the product family ranges in a selection of different combination of power and length where also type of flange, connecting terminals, thermal link and thermostat pocket can be selected.




## Combination of Power and length

Standard tubular elements with standard power rates: the single-phase models span in a range between 2.000W to 3.000W, while the three-phase models are available from 3.000W to 8.000W.
Higher power rates are also provided with 9.000W, 10.000W and 12.000W respectively.
The selection of desired power rate is by discrete values: narrower power step are available for smaller power rates.
Besides this, the combination of the diameter and length affects the range of possible power rates.
And since reliability is a design driver, power density is limited to 16W/cm$^2$ in order to guarantee long lifetime.
The following tables provide a summary of the possible power rates:

| POWER RATE [W] | Single-phase Ø6,25 mm | | |
|---|---|---|---|
| | 250 mm | 275 mm | 300 mm |
| 2000 | X | X | X |
| 2200 | X | X | X |
| 2400 | X | X | X |
| 2600 | X | X | X |
| 2800 | - | X | X |
| 3000 | - | X | X |

| POWER RATE [W] | Three-phase Ø6,25 mm | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 250 mm | 275 mm | 300 mm | 325 mm | 350 mm | 375 mm | 400 mm | 425 mm | 450 mm | 475 mm | 500 mm |
| 3000 | X | X | X | X | X | X | X | X | X | X | X |
| 3500 | X | X | X | X | X | X | X | X | X | X | X |
| 4000 | X | X | X | X | X | X | X | X | X | X | X |
| 4500 | - | X | X | X | X | X | X | X | X | X | X |
| 5000 | - | - | X | X | X | X | X | X | X | X | X |
| 5500 | - | - | - | X | X | X | X | X | X | X | X |
| 6000 | - | - | - | - | X | X | X | X | X | X | X |
| 6500 | - | - | - | - | - | X | X | X | X | X | X |
| 7000 | - | - | - | - | - | - | X | X | X | X | X |
| 7500 | - | - | - | - | - | - | - | X | X | X | X |
| 8000 | - | - | - | - | - | - | - | X | X | X | X |
| 9000 | - | - | - | - | - | - | - | - | - | X | X |
| 10000 | - | - | - | - | - | - | - | - | - | - | - |
| 12000 | - | - | - | - | - | - | - | - | - | - | - |

| POWER RATE [W] | Three-phase Ø8,5 mm | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 250 mm | 275 mm | 300 mm | 325 mm | 350 mm | 375 mm | 400 mm | 425 mm | 450 mm | 475 mm | 500 mm |
| 3000 | X | X | X | X | X | X | X | X | X | X | X |
| 3500 | X | X | X | X | X | X | X | X | X | X | X |
| 4000 | X | X | X | X | X | X | X | X | X | X | X |
| 4500 | X | X | X | X | X | X | X | X | X | X | X |
| 5000 | X | X | X | X | X | X | X | X | X | X | X |
| 5500 | X | X | X | X | X | X | X | X | X | X | X |
| 6000 | - | X | X | X | X | X | X | X | X | X | X |
| 6500 | - | X | X | X | X | X | X | X | X | X | X |
| 7000 | - | - | X | X | X | X | X | X | X | X | X |
| 7500 | - | - | - | X | X | X | X | X | X | X | X |
| 8000 | - | - | - | X | X | X | X | X | X | X | X |
| 9000 | - | - | - | - | - | X | X | X | X | X | X |
| 10000 | - | - | - | - | - | - | X | X | X | X | X |
| 12000 | - | - | - | - | - | - | - | - | - | X | X |

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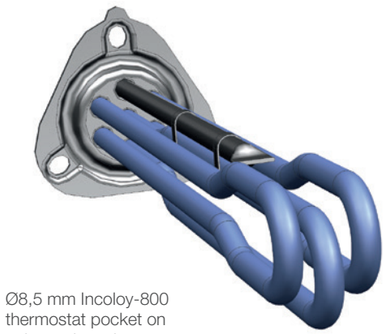
## Flanges

Consisting of stainless steel, flange is the mechanical connection between the heating element and the appliance. There are many different designs in the market but just a few of them are widely diffused: the Ø57 mm and Ø47 mm for three-phase models, Ø47 mm and Ø38,5 mm for the single phase. Shapes of flanges are several either, and the ZIHET catalog provides the combination of shapes and dimensions that perfectly suites the design of new dishwasher as well as the need of spare parts market. A laser marking on the flange reports the main part number information.

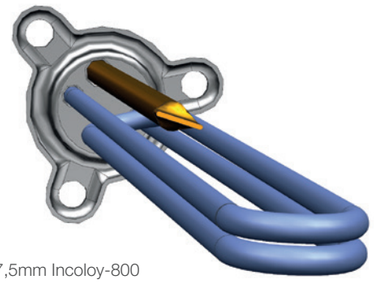
| Supply | Three-phase | | | Single-phase | |
|---|---|---|---|---|---|
| Shape |  |  |  |  |  |
| Dimension | Ø57 mm | Ø47 mm | Ø47 mm | Ø47 mm | Ø38,5 mm |
| Heater | Ø8,5 mm | Ø8,5 mm | Ø6,25 mm | Ø6,25 mm | Ø6,25 mm |

## Thermostat pocket

A metal sleeve is provided by default with each heating element in a position suitable for the mechanical contact to the heating rod (for three-phase models) or in the center of the flange (for single-phase models).



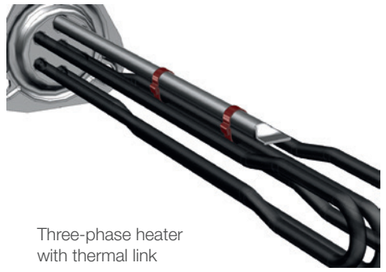
Ø8,5 mm Incoloy-800 thermostat pocket on a three-phase heater (with thermal link)



Ø7,5mm Incoloy-800 thermostat pocket on a single-phase heater (without thermal link)

## Thermal link

Thermal link is a mechanical connection capable of transmitting heat through a conductive metal tie. While heating element is on, the heat is easily transferred to the thermal pocket. Depending on the controls of the appliance, the transient can be faster (with thermal link) or slower (without thermal link).



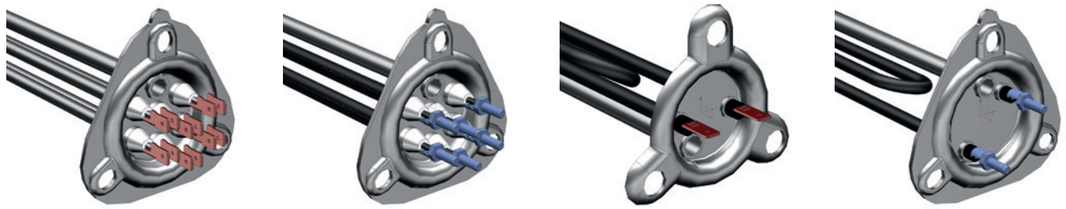
Three-phase heater with thermal link

Three-phase heater without thermal link

Option in not available for single-phase models.

## Connectors

Electrical connection with the power line is made by mean of either 6,3x0,8 mm male faston (single for single-phase models, double for three-phase models) or M4 threaded terminals.



Connecting bridges to set up either star or delta connection are not provided. The advantage of three-phase models is that the three single heating element can be connected to perform a single-phase heating element.

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## Configuration

The combination of options creates a unique 21 characters code that fully describes the attributes of the configured heating element.

Please note that the self compilation of the string could violate some design rules (i.e.: double faston connectors on a single-phase heater are not allowed), so get in contact with ZIHET sales representative for a support in the definition of feasible products or visit the TuPlam configurator page at https://xplam.zoppasindustries.com/tuplam.


| ENVIRONMENT | |
|---|---|
| A | IMMERSION IN WATER |

| MATERIAL | |
|---|---|
| A | INCOLOY-800 |

| VOLTAGE | |
|---|---|
| A | 230V |

| POWER | |
|---|---|
| A | 2000W |
| B | 2200W |
| C | 2400W |
| D | 2600W |
| E | 2800W |
| F | 3000W |
| G | 3500W |
| H | 4000W |
| I | 4500W |
| J | 5000W |
| K | 5500W |
| L | 6000W |
| M | 6500W |
| N | 7000W |
| O | 7500W |
| P | 8000W |
| Q | 9000W |
| R | 10000W |
| S | 12000W |

| QUOTE L | |
|---|---|
| A | 250mm |
| B | 275mm |
| C | 300mm |
| D | 325mm |
| E | 350mm |
| F | 375mm |
| G | 400mm |
| H | 425mm |
| I | 450mm |
| J | 475mm |
| K | 500mm |

| BATCH SIZE | |
|---|---|
| A | 5 pcs |
| B | 10 pcs |
| C | 25 pcs |
| D | 50 pcs |
| E | 100 pcs |
| F | 250 pcs |

| CONNECTORS | |
|---|---|
| A | Double 6,3x0,8 faston |
| B | M4 threaded connector |
| C | Single 6,3x0,8 faston |

| THERMOSTAT POCKET | |
|---|---|
| A | Incoloy 800 - Ø8,5mm |
| B | Incoloy 800 - Ø7,5mm |

| THERMAL LINK ON THERMOSTAT POCKET | |
|---|---|
| A | with Thermal link |
| B | without Thermal link |

| SHAPE | |
|---|---|
| A | TU03 - U Bended |
| B | TU09 - Refolded |

| FLANGE | |
|---|---|
| A | Ø57mm for Ø8,5 - 3P |
| B | Ø47mm for Ø8,5 - 3P |
| C | Ø47mm for Ø6,25 - 3P |
| D | Ø47mm for Ø6,25 - 1P |
| E | Ø38,5mm for Ø6,25 - 1P |

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