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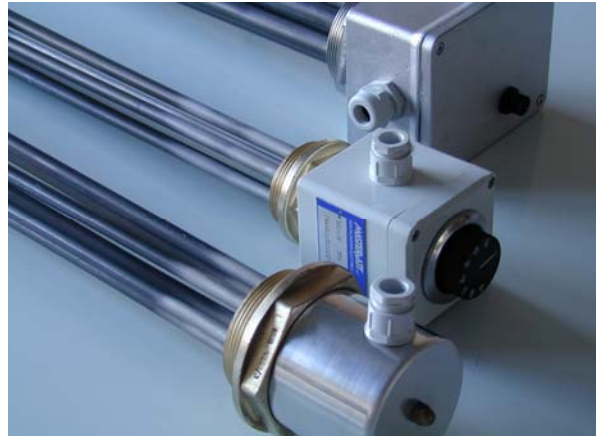
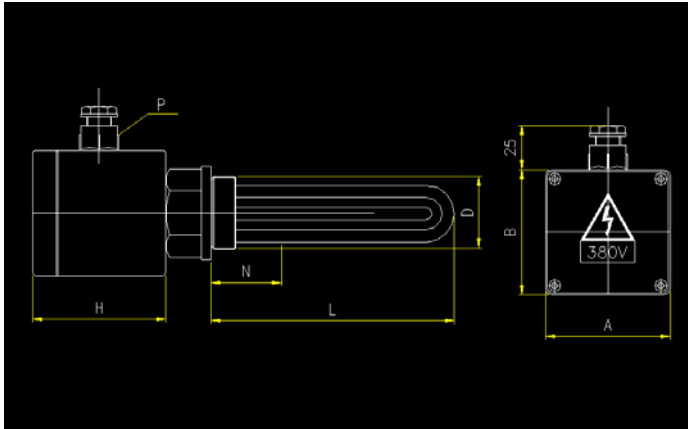
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Технические характеристики на нагреватели с резьбовыми пробками (винтовые нагреватели) КОМПАНИИ **MASTERWATT**

Figure 1: Typical sketch of an electric heater mounted on a threaded plug



GENERAL CHARACTERISTICS

The electric heaters mounted on a threaded plug have been conceived to satisfy the most different needs in the heating of liquid substances, both in the industrial and in the civil applications.

They are designed to be inserted into tubes, basins or pressurised tanks and they are sunk in direct contact with the fluid. Thanks to the presence of armoured electrical heaters, the heat exchange is very effective and it is possible to design very compact heaters.

These heaters are quite different from the flange-mounted heater: they are normally smaller and their heating power is lower.

These products are designed by our technical department on the basis of customer provided functional requirements. The design takes into account the physical, chemical and thermodynamic characteristics of the fluid to be heated, as well as the operating temperature, the features of the site and the allowable clearance in the area where the heater will be installed. The iteration between design and analysis leads to define:

1. the specific power and the required number of heating elements (1 or 3)
2. the threaded-plug dimensions
3. the maximum sheath temperature and, consequently, the safety devices to be used
4. the materials to be used in the construction
5. the dimensional characteristics of the heater

Thanks to the accumulated experience, to the data collected during in-house testing and to the return information provided by our customers, we can today propose the most appropriate materials and solutions to the customer.

The main characteristics of the heaters are defined in a technical data sheet, provided with the offer, which allows the customer verify the main electrical data and the mechanical interfaces to the plant.

TECHNICAL DATA

(see also Figure 1)

| | |
|-----|--------------------------------------|
| D | Threaded Plug Diameter |
| L | Maximum Length Below Ledge |
| N | Neutral (non heating) section |
| H | Electrical contact box height |
| A/B | Electrical contact box side envelope |
| P | cable gland |



TYPICAL INDUSTRIAL APPLICATIONS

- ↗ Oil pre-heating in lubrication gear cases
- ↗ Pre-heating of combustible oils in tanks
- ↗ anti-frost protection in storage tanks
- ↗ Hot/Warm water supply
- ↗ Food industry machinery
- ↗ Back-up heating unit

STANDARD HEATERS

Many application require heaters mounted on threaded plugs to **heat water or oil**. In these common situations, the possibility to select easily the required heater and trust on a **fast delivery** turns out to be very useful.

To cope with this need, a catalogue of heaters mounted on a threaded plug (**PLUG & PLAY heaters**) has been set-up. For these heaters the heating elements are ready on stock and, consequently, the **delivery** is normally feasible after **few days from the order**.

The main features of these heaters are:

1. Threaded **plug made of brass** and provided with a hexagonal wrench interface for heater installation
2. **Heating elements** fixed onto the plug by means of **brazing**. The soldering alloy allows operating pressure up to 12 bar (provided that a proper seal is used).
3. Neutral (i.e. non heating) section length equal to 40 mm
4. Two alternative possible for contact head:
 - a. **IP40 degree of protection** made of **Aluminium** (2 mm thick, maximum operating temperature 200 °C) provided with a rubber pass-through for power supply cable inlet (hole diameter = 12 mm for 1" ¼ and 1" ½ plugs, = 17 mm for 2" plugs and = 18 mm for 2" ½ plug)
 - b. **IP65 degree of protection** made of **polycarbonate** (operating temperature range -60 ÷ 125 °C), provided with a ½" Gas cable gland.
5. Possibility (only for IP65 contact box and not on all models) to provide the heater with embedded safety or regulation thermostat (measurement range: 30 ÷ 90 °C for 7 W/cm² heaters and 40 ÷ 220 °C for 2 W/cm²)

The typical **envelope** of these heaters are shown in **Figure 2** (heater with **IP40** contact box) and **Figure 3** (heater with **IP65** contact box). Table 1 summarises the main features of the threaded plugs.

Table 1: dimensional characteristics of threaded plugs

| Nominal diameter | Thread external diameter (mm) | Thread Height (mm) | Wrench diameter (mm) | Material |
|------------------|-------------------------------|--------------------|----------------------|----------|
| 1" ¼ Gas | 41,9 | 15 | 43 | Brass |
| 1" ½ Gas | 47,8 | 15 | 43 | Brass |
| 2" Gas | 59,6 | 15 | 57 | Brass |
| 2" ½ Gas | 75,1 | 20 | 86 | Brass |

Figure 2: typical envelope of a heater provided with an **IP40 contact box**

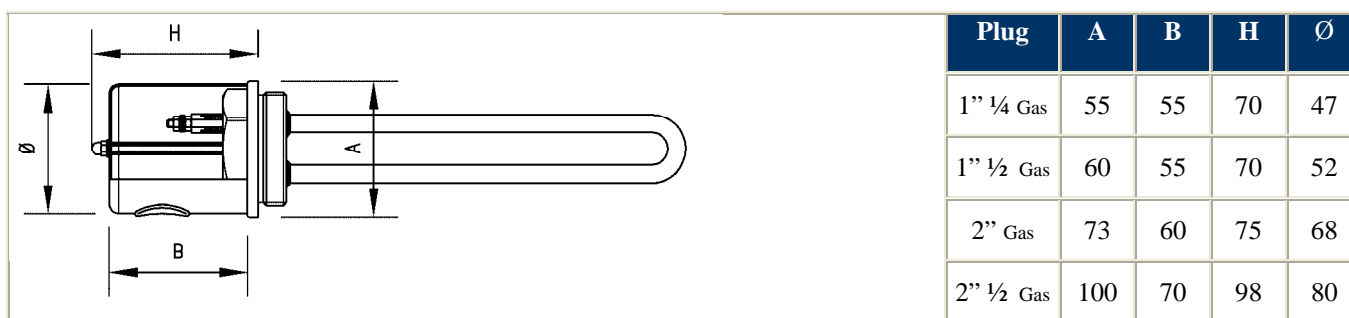
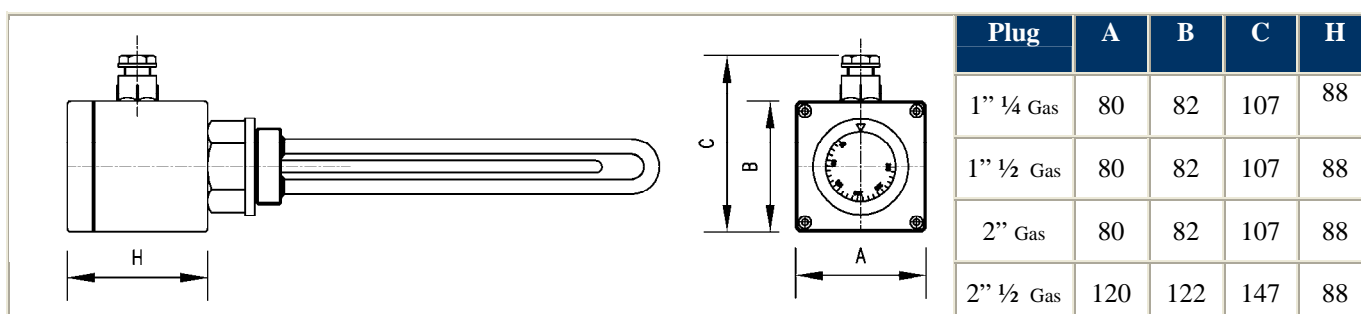


Figure 3: typical envelope of a heater provided with an **IP65 contact box**



These heaters can be provided in the following versions:

- Power supply at 230 V (monophase - 1 heating element) or at 400 V (tri-phase - 3 heating elements – star connection). 230V power supply (3 elements - delta connection) is also possible
- Specific power equal to 7 W/cm² or 2 W/cm²
- Available plugs: 1" ¼ Gas, 1" ½ Gas, 2" o 2" ½ Gas (the possibility to supply all the different heater typologies with all these threaded plugs changes from model to model)
- IP40 (aluminium) or IP65 (polycarbonate) contact box
- With or without thermostat (the version with thermostat is available only with IP65 contact box and is not present in all models)

In all cases the heating elements area made using an AISI 316Ti sheath. Their diameter can be 10 mm or 16 mm.

To choose one of our standard heaters, the following, first of all, shall be taken into account::

- To heat water the recommended heaters are those having a specific power of **7 w/cm²**, while for oil heating only **2 W/cm²** specific power heaters can be employed
- Standard heaters, due to their inherent manufacturing characteristics, **are not suitable** to heat: **demineralised or deionised water as well as hydraulic oils**. In these cases our Technical Department shall be contacted: a dedicated technical and cost proposal, tailored to the application needs, will be prepared. To prepare this type of offer, the data listed in Table 1 (see last page of this catalogue) shall be provided to our Technical Department.

PLUG & PLAY HEATER SELECTION

To select the heater suitable to your needs, the following steps shall be undertaken:

1. select the most appropriate specific power value depending on the application of interest
2. select, amongst the tables listed in next pages, those compatible with the desired power supply conditions
3. choose, within the tables that fulfil the first two selection criteria (specific power and voltage coherent with the application) that product whose dimensions (length below ledge), heating power, characteristics of the contact head (IP40 or IP65) and possibility to incorporate the thermostat, complies with the requirements of the application

4. mention the selected product code in the request for quotation or in the order that it is planned to issue. In defining the product code, the information in the tables below shall be taken into account:

| Contact Head Type | CC Code |
|-------------------------|---------|
| IP40 | 23 |
| IP65 without thermostat | 71 |
| IP65 with thermostat | 72 |

| Plug Thread | F Code |
|-------------|--------|
| 1" ¼ | T |
| 1" ½ | U |
| 2" | V |
| 2" ½ | Z |

HEATER WITH IP40 CONTACT HEAD



HEATER WITH IP65 CONTACT HEAD

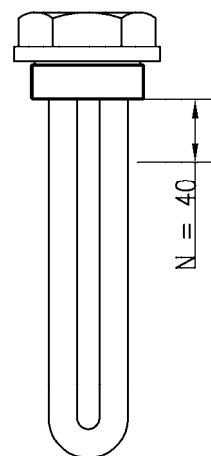
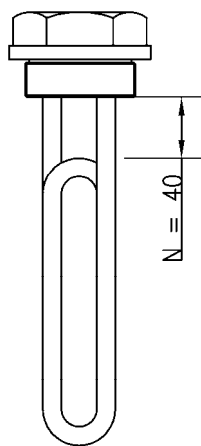
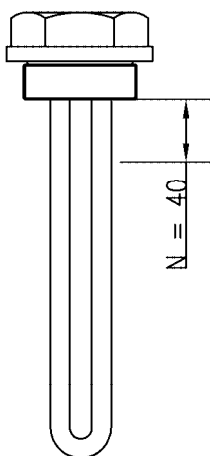


“PLUG & PLAY” HEATERS WITH HEATING ELEMENTS READY ON STOCK

N° 1 element Ø 10

N° 1 element Ø 10, 3-bents

**N° 1 element Ø 16
Mounted on a 2" ½ plug**



| 2 W/cm ² - 230 V monophasé | | |
|---------------------------------------|------|------|
| CODE | L mm | Watt |
| CCF101033500300 | 335 | 300 |
| CCF101040500400 | 405 | 400 |
| CCF101046500500 | 465 | 500 |
| CCF101059500650 | 595 | 650 |
| CCF101072500850 | 725 | 850 |
| CCF101086501000 | 865 | 1000 |
| CCF101099501200 | 995 | 1200 |
| CCF101140001650 | 1400 | 1650 |

| 2 W/cm ² - 230 V monophasé | | |
|---------------------------------------|------|------|
| CODE | L mm | Watt |
| CCF101019000300 | 190 | 300 |
| CCF101021500400 | 215 | 400 |
| CCF101026000500 | 260 | 500 |
| CCF101032000650 | 320 | 650 |
| CCF101039000850 | 390 | 850 |
| CCF101045001000 | 450 | 1000 |
| CCF101052001200 | 520 | 1200 |
| CCF101072001650 | 720 | 1650 |

| 2 W/cm ² - 230 V monophasé | | |
|---------------------------------------|------|------|
| CODE | L mm | Watt |
| CCZ161031000500 | 310 | 500 |
| CCZ161038000650 | 380 | 650 |
| CCZ161046000800 | 460 | 800 |
| CCZ161056001000 | 560 | 1000 |
| CCZ161068001250 | 680 | 1250 |
| CCZ161081001500 | 810 | 1500 |
| CCZ161093001750 | 930 | 1750 |
| CCZ161106002000 | 1060 | 2000 |

| 7 W/cm ² - 230 V monophasé | | |
|---------------------------------------|------|------|
| CODE | L mm | Watt |
| CCF101021500650 | 215 | 650 |
| CCF101025500850 | 255 | 850 |
| CCF101029501000 | 295 | 1000 |
| CCF101033501200 | 335 | 1200 |
| CCF101036501350 | 365 | 1350 |
| CCF101045001650 | 450 | 1650 |
| CCF101051502000 | 515 | 2000 |
| CCF101067502600 | 675 | 2600 |
| CCF101082503300 | 825 | 3300 |
| CCF101097504000 | 975 | 4000 |

| 7 W/cm ² - 230 V monophasé | | |
|---------------------------------------|------|------|
| CODE | L mm | Watt |
| CCF101013500650 | 135 | 650 |
| CCF101015000850 | 150 | 850 |
| CCF101017001000 | 170 | 1000 |
| CCF101019001200 | 190 | 1200 |
| CCF101021001350 | 210 | 1350 |
| CCF101024501650 | 245 | 1650 |
| CCF101028002000 | 280 | 2000 |
| CCF101036002600 | 360 | 2600 |
| CCF101043503300 | 435 | 3300 |
| CCF101051004000 | 510 | 4000 |

| 7 W/cm ² - 230 V monophasé | | |
|---------------------------------------|------|------|
| CODE | L mm | Watt |
| CCZ161020001000 | 200 | 1000 |
| CCZ161024001250 | 240 | 1250 |
| CCZ161027001500 | 270 | 1500 |
| CCZ161031001750 | 310 | 1750 |
| CCZ161035002000 | 350 | 2000 |
| CCZ161042002500 | 420 | 2500 |
| CCZ161049003000 | 490 | 3000 |
| CCZ161056003500 | 560 | 3500 |
| CCZ161063004000 | 630 | 4000 |
| CCZ161092006000 | 920 | 6000 |

NOTE:
NO 2" ½ (code F = Z) EXECUTION
FORESEEN IN THIS FAMILY

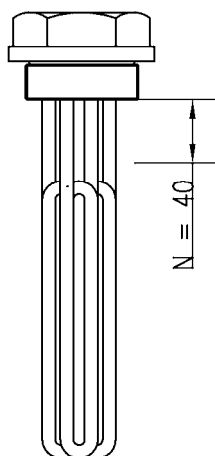
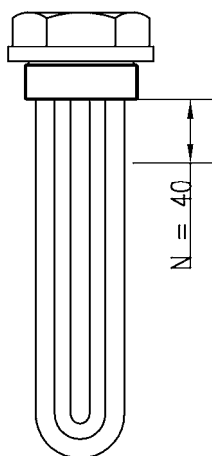
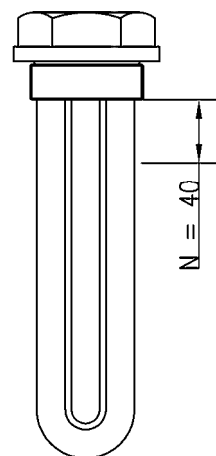
NOTE:
NO 2" ½ (code F = Z) EXECUTION
FORESEEN IN THIS FAMILY

NOTE:
ONLY 2" ½ (code F = Z) EXECUTION
FORESEEN IN THIS FAMILY

ATTENTION

To define exactly the code of the desired heater:

- substitute letters “CC” with the Contact Head Code (23 = IP40, 71 = IP65 without thermostat, 72 = IP65 with thermostat)
- substitute letter “F” (if present) with the plug-thread code (T = 1" ¼ gas, U = 1" ½ gas, V = 2" gas, Z = 2" ½ gas)

N° 3 elements Ø 10, 3-bents, mounted on a 2" ½ plug

N° 3 elements Ø 10

N° 3 elements Ø 16


| 2 W/cm ² - 400 V tri-phase/star | | |
|--|------|------|
| CODE | L mm | Watt |
| CCZ103019001000 | 190 | 1000 |
| CCZ103021501200 | 215 | 1200 |
| CCZ103026001500 | 260 | 1500 |
| CCZ103032002000 | 320 | 2000 |
| CCZ103039002500 | 390 | 2500 |
| CCZ103045003000 | 450 | 3000 |
| CCZ103052003500 | 520 | 3500 |
| CCZ103072005000 | 720 | 5000 |

| 2 W/cm ² - 400 V tri-phase/star | | |
|--|------|------|
| CODE | L mm | Watt |
| CCF103033001000 | 330 | 1000 |
| CCF103038501200 | 385 | 1200 |
| CCF103046001500 | 460 | 1500 |
| CCF103059002000 | 590 | 2000 |
| CCF103072002500 | 720 | 2500 |
| CCF103086003000 | 860 | 3000 |
| CCF103099003500 | 990 | 3500 |

| 2 W/cm ² - 400 V tri-phase/star | | |
|--|------|------|
| CODE | L mm | Watt |
| CCZ163056003000 | 560 | 3000 |
| CCZ163068003750 | 680 | 3750 |
| CCZ163081004500 | 810 | 4500 |
| CCZ163093005250 | 930 | 5250 |
| CCZ163106006000 | 1060 | 6000 |

| 7 W/cm ² - 400 V tri-phase/star | | |
|--|------|-------|
| CODE | L mm | Watt |
| CCZ103013502000 | 135 | 2000 |
| CCZ103015002500 | 150 | 2500 |
| CCZ103017003000 | 170 | 3000 |
| CCZ103019003500 | 190 | 3500 |
| CCZ103021004000 | 210 | 4000 |
| CCZ103024505000 | 245 | 5000 |
| CCZ103028006000 | 280 | 6000 |
| CCZ103036008000 | 360 | 8000 |
| CCZ103043510000 | 435 | 10000 |
| CCZ103051012000 | 510 | 12000 |

| 7 W/cm ² - 400 V tri-phase/star | | |
|--|------|-------|
| CODE | L mm | Watt |
| CCF103021002000 | 210 | 2000 |
| CCF103025002500 | 250 | 2500 |
| CCF103029003000 | 290 | 3000 |
| CCF103033003500 | 330 | 3500 |
| CCF103036004000 | 360 | 4000 |
| CCF103044505000 | 445 | 5000 |
| CCF103051006000 | 510 | 6000 |
| CCF103067008000 | 670 | 8000 |
| CCF103082010000 | 820 | 10000 |
| CCF103097012000 | 970 | 12000 |

| 7 W/cm ² - 400 V tri-phase/star | | |
|--|------|-------|
| CODE | L mm | Watt |
| CCZ163035006000 | 350 | 6000 |
| CCZ163044008000 | 440 | 8000 |
| CCZ163054010000 | 540 | 10000 |
| CCZ163063012000 | 630 | 12000 |
| CCZ163077015000 | 770 | 15000 |
| CCZ163092018000 | 920 | 18000 |
| CCZ163101020000 | 1010 | 20000 |

NOTE:

ONLY 2" ½ (code F = Z) EXECUTION FORESEEN IN THIS FAMILY and IT IS NOT POSSIBLE TO REQUEST THE THERMOSTAT (CC code = 72)

NOTE:

NO 1" ¼ (code F = T) EXECUTION FORESEEN IN THIS FAMILY and NO THERMOSTAT (CC code = 72) CAN BE REQUESTED IF 1" ½ PLUG IS EMPLOYED

NOTE:

ONLY 2" ½ (code F = Z) EXECUTION FORESEEN IN THIS FAMILY

ATTENTION

To define exactly the code of the desired heater:

- substitute letters "CC" with the Contact Head Code (23 = IP40, 71 = IP65 without thermostat, 72 = IP65 with thermostat)
- substitute letter "F" (if present) with the plug-thread code (T = 1" ¼ gas, U = 1" ½ gas, V = 2" gas, Z = 2" ½ gas)

DATA REQUIRED FOR A CORRECT DEFINITION OF A HEATER MOUNTED ON THREADED PLUG

To design a plug-mounted heater a set of data is required. The availability of all the data is a pre-requisite for an optimum sizing and for a precise definition of the heating power. The Table 1 presented hereunder summarises the required data.

Table 1: data required to design a plug-mounted heater

| Design Data | Notes | |
|---|--|--|
| Thermodynamic Data | | |
| Fluid Note: More information on fluids characteristics are contained in the " Useful Technical Information " Volume | ⇒ water ⇒ oil ⇒ other (please specify)..... | |
| Fluid Quantity | ⇒ in litres. If variable, please specify min. and max | |
| Tank Volume and dimensions | ⇒ in m ³ (volume) and mm (dimensions) | |
| Thermal Insulation | ⇒ Please specify if the tank is thermally insulated | |
| Design pressure | ⇒ in bar absolute | |
| Maximum operating pressure | ⇒ in bar absolute | |
| Design Temperature | ⇒ in degrees centigrade | |
| Temperature at start up | ⇒ in degrees centigrade | |
| Required Temperature | ⇒ in degrees centigrade | |
| Plant start up time | ⇒ Please specify the maximum time available for the heater to bring the fluid to the required temperature. (Attention! This datum shall be carefully evaluated to avoid an over sizing of the heater electric power) | |
| Installation | ⇒ Horizontal / Vertical (in this case, please make sure that the liquid level is always above the neutral section threshold) ⇒ Outdoor / Indoor | |
| Type of connection to the plant | ⇒ please specify the coupling thread | |
| Envelope | ⇒ Please specify max. envelope, all included | |
| Electrical Data | | |
| Installed Power | ⇒ in kW | |
| Power Supply Voltage | ⇒ in Volt | |
| Type of Electrical connection | ⇒ Star / Delta / Monophase | |
| Contact Head Protection | ⇒ IP 00/40/65 | |
| Cable glands (if required) | Please specify: material and Φ external of the power supply cable | |
| Control | | |
| Power | ⇒ On/Off / SCR (Solid Control Relais) / On/Off + SCR | |
| Fluid thermal sensor | ⇒ please specify number and type | |
| Sheath thermal sensor | ⇒ please specify number and type | |
| Certifications and Calculations | | |
| ATEX Certification | ⇒ see Explosion Proof Heaters catalogue | |

NOTE: Data in bold character must be provided to insure a correct sizing of the heater. For the remaining data, missing specific customer information, Masterwatt standards will be applied

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