# HHS

nVent RAYCHEM

# HOPPER HEATING SYSTEM

## PRODUCT OVERVIEW

Air pollution laws require the use of Electrostatic Precipitator (ESP) hoppers, baghouse hoppers and material / dust-collector hoppers to capture and extract the dirty, dust laden fly ash residue particles from the boiler prior to the release of flu gas into the atmosphere.

The nVent RAYCHEM Hopper Heating System (HHS) is designed to provide uniform heat distribution throughout the entire hopper module to prevent moisture condensation from collecting during start-up, and maintaining the hopper temperature above the flue gas acid dew point (135-140°C) during normal operating conditions. This serves to reduce the build-up of fly ash on the hopper walls to keep the fly ash in a continual flowing condition prior to release.

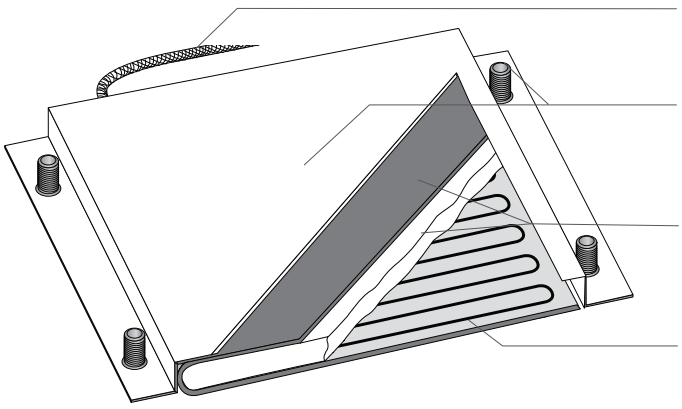
The HHS heater module design consists of multi-stranded Inconel and Nichrome alloy heating elements protected by a thick layer of fiberglass insulation inside a flexible, high-temperature, moisture resistant jacket that meets and exceeds typical power requirements (4,650 w/m²) for maintain and heat-up capabilities. This heater is protected by a durable corrosion resistant 304 stainless steel frame which safeguards the heater during handling, installation and operation.

RAYCHEM HHS is engineered by nVent based on the unique heating requirements of the application. The HHS heaters are constructed to provide maximum heater contact for efficient and even heat distribution to the hopper wall on surfaces that are prone to vibration, poking and hammering; reducing the potential for heat loss, while maximizing the energy efficiency of the heating system.

These heating modules are mounted to the hopper wall with simple stud welds and do not require additional mounting channels, which shortens the heater installation time. The HHS heating modules are engineered for a 25 year design life and are FM approved for non-hazardous locations and benchmarked against IEEE design standards.

The RAYCHEM HHS is complemented with a range of high-temperature, flexible, wrap-wound heaters (HHS-WWH), designed to heat the (non-flat) conical / throat and poke tube portions of the hopper. These heaters utilize the same multi-stranded heating elements as the HHS heater modules and are protected by a double-braided insulation and outer sheath for increased durability in harsh environments and are mounted to the throat of the hopper with high-temperature tie-downs. nVent also offers a complete line of RAYCHEM mechanical thermostats and electronic control, monitoring and power distribution systems designed specifically for these electric heating applications.

## HHS HEATER MODULE DESIGN



**High Temperature Lead Wire**
- Stainless steel overbraid with ground path
- Reinforced strain relief withstands 125 Nm of pull force

**Modular Heater Cladding**
- Safeguards the heater during handling, installation and operation
- 304 stainless steel resists corrosion
- Simple stud welded mounting simplifies reliable heater installation

**Modular Heater Insulation & Jacketing**
- Fiberglass insulation protects heating element
- Outer jacket contours to the hopper surface for even heat distribution
- Jacketing material tested up to 970°C

**Multi-Stranded Heating Element**
- Inconel and nichrome alloy heating elements
- Minimum of 6 parallel paths for efficient heat transfer
- 65+ years of use in industrial applications

## HHS HEATER MODULE APPROVALS

FM APPROVED

Non-hazardous Areas

## HHS HEATER MODULE PRODUCT SPECIFICATIONS

| | |
|---|---|
| Power density | Standard wattages up to 4650 W/m² (3.0 W/in²) |
| Voltage range (nominal) | 120 - 600 VAC |
| Maximum continuous exposure / maintain temperature | 260°C (500°F) |
| Maximum intermittent exposure temperature (power off) | 538°C (1000°F) |
| Minimum installation temperature | –20°C (–4°F) |
| Typical heater set point | 120-150°C (248-300°F) |
| Dielectric strength | Up to 2,200 VAC |
| Power leads* | 5.0m (16 ft.) long, moisture resistant, high-temperature stainless steel overbraid with a standard heater ground wire |

* Lead wire length can be customized to align with the project design requirements.

## HHS HEATER MODULE PRODUCT ORDERING MATRIX

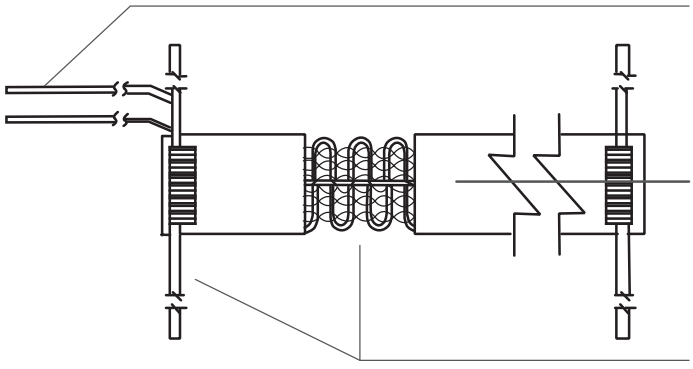
| H H S – | X X – | X X X – | X X X – | (N) – | X X X – | (F) |
|---|---|---|---|---|---|---|
| HOPPER HEATING SYSTEM | SIZE DIMENSION ONE | SIZE DIMENSION TWO | SUPPLY VOLTAGE | WATT DENSITY | VARIABLE LEAD WIRE LENGTH | CONDUIT FITTING |
| | 07-61 cm | 021-183 cm | 120-600 VAC | 775 - 4650 W/m² | 099-998 cm | 1/2" NPT (Male)* |

* For additional conduit fitting requirements, please contact nVent.

**WATT DENSITY** Units of W/m²

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 3875 | | K | 1395 | U | 2248 | AE | 3023 | AO | 3798 |
| B | 1550 | | L | 1473 | V | 2325 | AF | 3100 | AP | 3953 |
| C | 775 | '<-- MIN. | M | 1628 | W | 2403 | AG | 3178 | AQ | 4030 |
| D | 853 | | N | 1705 | X | 2480 | AH | 3255 | AR | 4108 |
| E | 930 | | O | 1783 | Y | 2558 | AI | 3333 | AS | 4185 |
| F | 1008 | | P | 1860 | Z | 2635 | AJ | 3410 | AT | 4263 |
| G | 1085 | | Q | 1938 | AA | 2713 | AK | 3488 | AU | 4340 |
| H | 1163 | | R | 2015 | AB | 2790 | AL | 3565 | AV | 4418 |
| I | 1240 | | S | 2093 | AC | 2868 | AM | 3643 | AW | 4495 |
| J | 1318 | | T | 2170 | AD | 2945 | AN | 3720 | AX | 4573 |
| | | | | | | | | | AY | 4650 |

## HHS-WWH WRAP-WOUND HEATER DESIGN



**High Temperature Lead Wire**
- Stainless steel overbraid with ground path
- Choice of power lead location on either the same or opposite ends

**Wrap-Wound Heater Insulation & Jacketing**
- High-temperature insulation protects heating element
- Durable outer jacketing contours to non-flat surfaces even heat distribution
- Designed for exposure temperatures up to 760°C (1400°F)

**Multi-Stranded Heating Element**
- Inconel and nichrome alloy heating elements
- Minimum of 6 parallel paths for efficient heat transfer
- Includes high-temperature tie-downs for easy installation

## HHS-WWH WRAP-WOUND HEATER PRODUCT SPECIFICATIONS

| | |
|---|---|
| Power density | Standard wattages up to 4650 W/m² (3.0 W/in²) |
| Voltage range (nominal) | 120 - 600 VAC |
| Maximum exposure temperature | 760°C (1400°F) |
| Maximum maintain temperature (power on) | 500°C (932°F) |
| Minimum installation temperature | –20°C (–4°F) |
| Typical heater set point | 120-150°C (248-300°F) |
| Dielectric strength | Up to 2,200 VAC |
| Power leads* | 5.0m (16 ft.) long, moisture resistant, high-temperature stainless steel overbraid with a standard heater ground wire |

* Lead wire length can be customized to align with the project design requirements.

## HHS-WWH WRAP-WOUND HEATER PRODUCT ORDERING MATRIX

| H H S W W H – | X X – | X X X – | X X X – | (N) – | X X X – | (Y) |
|---|---|---|---|---|---|---|
| WRAP-WOUND HEATER | SIZE DIMENSION ONE | SIZE DIMENSION TWO | SUPPLY VOLTAGE | WATT DENSITY | VARIABLE LEAD WIRE LENGTH | END TERMINATION |
| | 1.3-8.3 cm | 060-370 cm | 120-600 VAC | 775 - 4650 W/m² | 099-998 cm* | Base Wire Y<br>Ferrule Crimp Z |

* For a single power lead on opposite ends, contact nVent.

**WATT DENSITY** Units of W/m²

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 3875 | | K | 1395 | U | 2248 | AE | 3023 | AO | 3798 |
| B | 1550 | | L | 1473 | V | 2325 | AF | 3100 | AP | 3953 |
| C | 775 | '<-- MIN. | M | 1628 | W | 2403 | AG | 3178 | AQ | 4030 |
| D | 853 | | N | 1705 | X | 2480 | AH | 3255 | AR | 4108 |
| E | 930 | | O | 1783 | Y | 2558 | AI | 3333 | AS | 4185 |
| F | 1008 | | P | 1860 | Z | 2635 | AJ | 3410 | AT | 4263 |
| G | 1085 | | Q | 1938 | AA | 2713 | AK | 3488 | AU | 4340 |
| H | 1163 | | R | 2015 | AB | 2790 | AL | 3565 | AV | 4418 |
| I | 1240 | | S | 2093 | AC | 2868 | AM | 3643 | AW | 4495 |
| J | 1318 | | T | 2170 | AD | 2945 | AN | 3720 | AX | 4573 |
| | | | | | | | | | AY | 4650 |

## SYSTEM DESIGN CONSIDERATIONS

- To ensure optimal performance, each system must be engineered by nVent based on the heating requirements of the application.
- Heater watt densities and operating voltages are based on application specific requirements.
- nVent offers a complete line of mechanical thermostats and electronic control, monitoring and power distribution systems designed specifically for these electrical heating applications.
- All HHS heating modules include hardware comprised of studs, washers, nuts and a mounting template* is also supplied for each unique heater size to facilitate the proper marking of the mounting stud locations prior to installation of heaters.
- All HHS-WWH heaters are supplied with high-temperature tie-downs for attachment to the throat of the hopper.
- Reference document H59848 for detailed HHS product installation, operating and maintenance instructions.
- Reference document H60043 for detailed HHS-WWH product installation, operating and maintenance instructions.

* Quantity of templates supplied will align with individual project requirements.

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