

GENERAL SPECIFICATION

HVAC

GS EP HVA 211

Electrical Heater(s)

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04	10/2009	Updating of "Reference documents"
03	10/2005	Addition of "EP" root to GS identification
02	10/2004	Updating
00	10/2002	First issue
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1. Scope

This document defines the minimum requirements for design, construction and installation of electrical duct heaters in *HVAC* systems. This document is also applicable for electrical heaters installed inside constant or variable volume boxes.

The words and expressions in capital characters and italic are defined inside the general specification **GS EP HVA 801**.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

Equipment and installations must be in accordance with (in order of precedence):

1. The country local regulations where equipment and/or installations shall be operated
2. Total General Specifications as listed in **GS EP HVA 000**
3. The International Standards
4. The French Regulation (when Country local regulation does not exist).

International System of Units (SI) shall be used, whatever the document (drawing, data sheet, documentation...).

Notes:

- In case of discrepancy between documents (whatever the documents and / or whatever origins), the most expensive solution must be quoted by *BIDDER*. During the studies (Basic Engineering and / or Detailed Engineering) *CONTRACTOR*(s) shall raise the discrepancy in question to *COMPANY*'s *HVAC SPECIALIST* who will then review and advise which document(s) is (are) to be specified for the project.
- *HVAC VENDOR* or *CONTRACTOR* may propose proven improvements to the reference documents but must obtain written approval of *COMPANY* prior to implementation.
- An International Standard is a good "engineering practice" which shall be recognised and taken into consideration by *VENDOR*, *SUPPLIER*, *MANUFACTURER* and/or *CONTRACTOR*. If required, the translation of the standards must be included into *HVAC* scope.
- The latest revision of standards, codes, regulations and the published errata if any must be used and applied by *VENDOR*, *SUPPLIER*, *MANUFACTURER* and *CONTRACTOR*.

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External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
Directive 94/9/EC, referred to a ATEX 100a/95	Directive of the European Parliament and the Council on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres.
IEC 60079 (All parts)	Electrical apparatus for explosive gas atmosphere (All parts)
IEEE 519	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP ELE 031	Design of earthing and bonding systems
GS EP HVA 000	List of HVAC specifications
GS EP HVA 010	Selection of Stainless Steel Grade for HVAC Equipment
GS EP HVA 400	Ducts and Accessories for HVAC Systems
GS EP HVA 801	Terminology, Definitions, Abbreviations
GS EP HVA 802	Documents to be Supplied for Basic Engineering and Detailed Engineering
GS EP HVA 830	Typicals HVAC P&ID - D&ID

3. Electrical Heaters

An electrical duct heater is a specific part of ducting equipped with electrical heating elements and associated instruments. The purpose of the electrical duct heater is to increase air temperature within a ductwork.

Each electrical duct heater shall be mainly composed of the following components:

- A section of duct, so called the casing (except in case of heater included in constant or variable volume box)
- Sheathed heating element with fins or smooth surface

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- Electrical coupling and connection box (IP55 enclosure) (except in case of heater included in constant or variable volume box)
- Instruments
- A guard grille upstream the heating elements (except in case of heater is included in constant or variable volume box).

3.1 Design

The electrical duct heater shall be designed in accordance with the following criteria:

- Surface temperature of the heating element(s) shall not exceed 90°C (without air flow)
- Air pressure drop created by electrical duct heater, at the nominal air flow rate, shall not exceed 60 Pa
- *AIR VELOCITY* in an electrical duct heater shall be between 2 and 7 m/s
- The dimensions of the casing shall be the same as the dimensions of the upstream and downstream ducts
- The heating elements shall be evenly installed along the casing area.

3.2 Construction

3.2.1 Casing

The present section is not applicable in case of heater is included in constant or variable volume box.

The casing material shall be the same as the material used for the ducting where the duct heater is installed.

The *HVAC CONTRACTOR*, being in charge to define the ductwork material and thickness, shall inform the *MANUFACTURER* about the casing material and the casing thickness of duct heater.

Correspondence table:

Ducting material	Duct heater casing material
Galvanized steel	Galvanised steel Z400 or stainless steel
Stainless steel	Stainless steel
Fib-Air* (or similar)	Galvanised steel Z400 or stainless steel

*: Fib-Air is a trade mark

The casing thickness shall be, at least, the same as the thickness of the ducting where the duct heater is installed.

The casing shall be provided with flanges. The flanges thickness shall be, at least, the same as the thickness of the ducting flanges where the duct heater is installed. The drilling standard defined for ducting shall be applied for duct heaters flanges (refer to **GS EP HVA 400**).

The components of the duct heater shall not be located beyond the space defined by the flanges of the casing.

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The casing shall be provided with two earthing bosses in accordance with **GS EP ELE 031**.

3.2.2 Heating Elements

The electrical elements shall be black heat type. The tubular elements shall be stainless steel packed with magnesium oxide. Other stainless steel grade than those specified in **GS EP HVA 010** shall be submitted to COMPANY HVAC SPECIALIST for approval.

Dilatation shall be considered for integration within ducts or casings.

3.2.3 Temperature Switches

Electrical duct heater shall be provided with the following temperature switches:

- A "Very High" temperature switch (TSHH) with manual reset shall be installed in order to trip the relay supplying the heater, in case the surface temperature of the heating elements exceeds 100°C
- A "High" temperature switch (TSH) with automatic reset shall be installed in order to trip the relay supplying the heater, in case the surface temperature of the heating elements exceeds 90°C

Information for HVAC CONTRACTOR:

- Action for power tripping, from TSH and TSHH, via a PLC, is not permitted
- Temperature fault shall be monitored and shown on HVAC CC HMI or HVAC CC front panel (LED).

Refer also to **GS EP HVA 830**, sheet 70.

3.2.4 Air Flow Switch

Electrical duct heater shall be provided with an air flow switch (differential pressure switch). In case of air flow shortage, this air flow switch shall automatically trip the relay supplying the heater.

Information for HVAC CONTRACTOR:

- Action for power tripping, from air flow switch, via a PLC, is not permitted;
- Air flow fault shall be monitored and shown on HVAC CC HMI or HVAC CC front panel (LED).

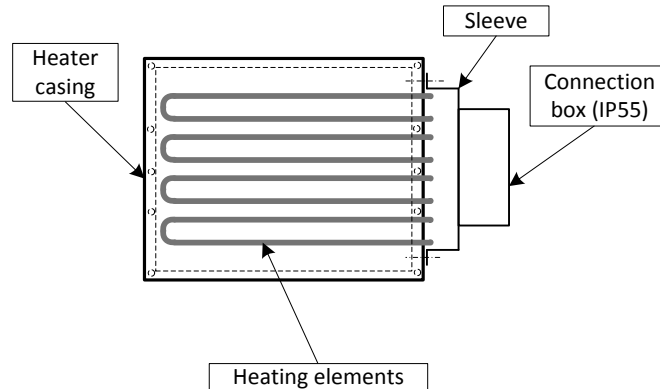
Refer also to **GS EP HVA 830**, sheet 70.

3.2.5 Electrical Part

A sleeve shall be installed between the duct heater casing and the connection box (refer to Figure 1).

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Figure 1: Example of sleeve arrangement on electrical heater



The heating elements shall be wired by the *MANUFACTURER* to the terminals located in the connection box of the duct heater.

Electrical connections of all components shall be easily accessible.

The connection box shall be out of the air stream.

3.2.6 Control

Electrical duct heater with heating capacity up to 4.0 kW shall be controlled by a step controller (three stages) or a three stage thermostat.

Electrical duct heaters with heating capacity above 4.0 kW shall be pre-wired for thyristor control.

Information for HVAC CONTRACTOR / MANUFACTURER:

- In case of thyristors are used for heaters capacity control, the Manufacturer of temperature controller / thyristors shall ensure that current harmonic rejection (due to operation of electrical heaters) shall remain below the limits defined in IEEE 519 Table 10-3, with I_{sc}/I_L ratio of less than 50, as a minimum requirement (i.e. ratio even less than 50 could be considered in particular project conditions).
- The above requirement shall be applied for each duct heater. In case of several duct heaters are controlled by one temperature controller / thyristors, the above requirement shall be applied for the group of duct heaters.

3.3 Installation

The heating elements shall be installed in order to be easily dismantled for cleaning or maintenance.

Information for *HVAC CONTRACTOR*:

- An homogeneous air flow distribution across the heating elements shall be ensured. A minimum distance of 1300 mm (upstream and downstream) shall separate the duct heater from any elbow, transition piece, filter, frame member, or damper. Any more stringent requirements from the *MANUFACTURER* regarding minimum recommended distances shall be respected;

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- In case of a duct heater is immediately located downstream a *FAN*, the duct heater shall be located at a minimum distance of 10 time the equivalent diameter of the duct;
- An inspection door shall be provided upstream and downstream each electrical duct heater. The inspection door shall be located at a distance of 500 mm from the duct heater;
- Local electrical isolating switch(es), according to the number of power stages, shall be provided by the *HVAC CONTRACTOR*. This (these) switch(es) shall be installed in a dedicated cabinet located close to the duct heater. This dedicated cabinet and its internal components shall be provided and installed by the *HVAC CONTRACTOR*.

Refer to **GS EP HVA 400** for additional requirements.

3.4 Coupling and Cabling

The coupling of the heating elements shall be made by the *MANUFACTURER*.

The cabling of the power supply up to the terminals of the duct heater connection box shall be performed by the *HVAC CONTRACTOR*.

4. ATEX-Certified Electrical Heaters

In case a duct heater must be ATEX-certified, only certification by Notified Body is accepted by COMPANY (self-certification by *MANUFACTURER* is not allowed, even when a certification delegation is granted by Notified Body).

5. Documents to be Provided by *MANUFACTURER*

Upon request from the *HVAC CONTRACTOR*, the *MANUFACTURER* shall provide documents listed in **GS EP HVA 802**, applicable to duct heaters but not limited to:

- Quality plan
- Calculation note
- Data sheets (duct heater, instruments,...)
- Wiring diagrams
- General arrangement drawings
- Weight and gravity center
- ATEX certification (when applicable).

6. Electrical heater name plate

This section is not applicable in case of duct heater(s) is(are) installed in a constant volume box or in a variable volume box.

A name plate shall be provided by the *MANUFACTURER*, for each electrical duct heater.

The minimum information to be indicated on the name plate of the electrical duct heater is listed in the hereafter table.

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Metallurgy of name plates shall be stainless steel AISI 316, whatever the location of equipment (**GS EP HVA 010** shall not be applied). Each name plate shall be mechanically fixed on the equipment. Rivets shall be used for fixing and metallurgy of the rivets shall be stainless steel AISI 304 or 316.

In case indication of the performance is required on the name plate, the performance in nominal conditions of the project shall be indicated.

The name plate has to be fixed on the casing of the duct heater.

Information	Unit	Comment (not indicated on name plate)
Project name:	-	
Equipment designation on the project:	-	
Duct heater tag number:	-	
Name of the <i>MANUFACTURER</i> :	-	
Address of the <i>MANUFACTURER</i> :	-	
Phone number of the <i>MANUFACTURER</i> :	-	
Delivery date:	-	
Duct heater type:	-	As per <i>MANUFACTURER</i> codification
Duct heater serial number:	-	
Purchase order number:	-	
Voltage:	V	
Phase(s):	-	
Heating capacity:	kW	Capacity of each stage
Differential pressure loss:	Pa	Data corresponding to the <i>DESIGN POINT</i> of the equipment
Maximum surface temperature on heater:	°C	
Nominal entering / leaving air temperature (for each stage):	°C	
TSH setting point:	°C	
TSHH setting point:	°C	
Differential pressure loss (inlet – outlet air side):	Pa	
Net mass:	kg	
ATEX certification marking:		When ATEX certification marking is required



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7. Other References

Following external documents are applicable: [Directive 94/9/EC](#), referred to a [ATEX 100a/95](#), [IEC 60079 \(All parts\)](#)