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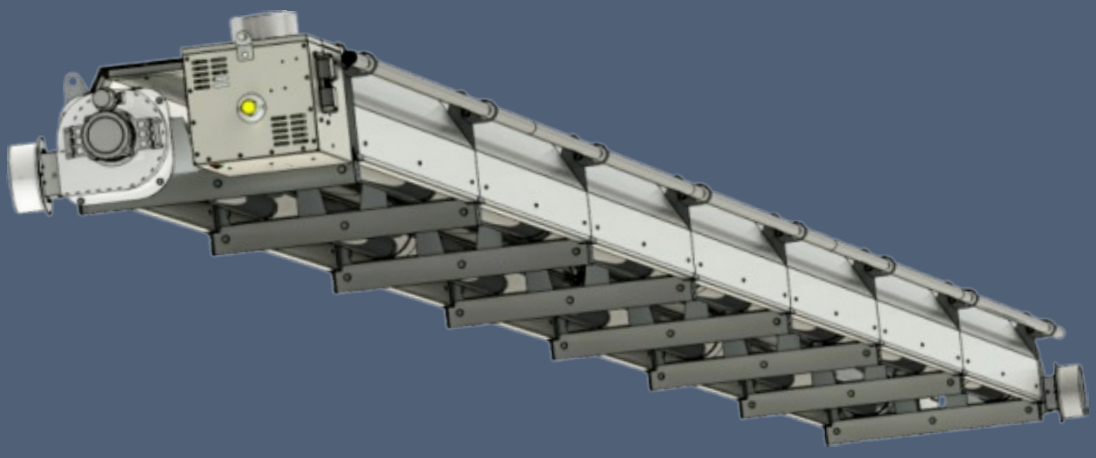
MANDÍK®

# DARK TUBE INFRARED HEATER HELIOS-S

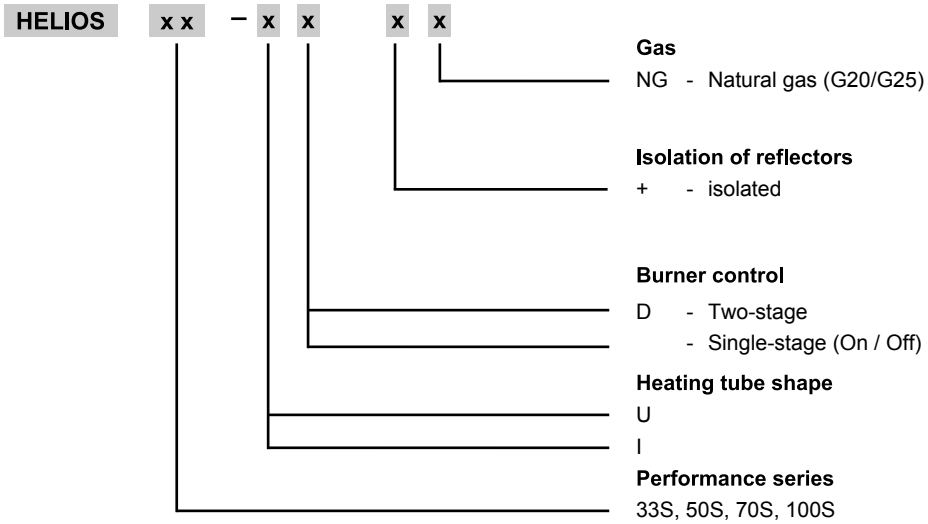


**These technical conditions define design and performance series of the dark tube infrared heaters HELIOS-S (hereinafter as infrared heaters). It is applicable for manufacture, design, ordering and deliveries.**

## I. CONTENT

## II. ORDERING DATA

### 1. Ordering key




## III. GENERAL

### 2. Description of infrared heater HELIOS

Dark tube infrared heater HELIOS-SI (single-stage) and HELIOS-SID (two-stage) is a modern ecological gas heater. It can be supplemented with an economizer to utilize the residual heat of the flue gas.

In terms of operating temperature of active surfaces and thus in terms of the particular wavelength of the emitted radiation, the device belongs to the category of so-called "dark" infrared heaters. The active surface is formed by radiant pipes and a reflector. In the radiant pipes there is the process of fuel gas burning and there are also burnt gases flowing through the pipes to the mouth of the exhaust fan. Fuel burning is carried out by an atmospheric burner which is automatically controlled. The reflector prevents the pipes from cooling by the process of convection. The reflector itself warms up by the radiant pipes and radiates the heat in the required direction.

Normal operating fuel of the HELIOS infrared heaters:

- natural gas – NG (G20/G25)

Product category:

- $II_{2E3B/P}$, $II_{2ELL3B/P}$, design $A_2$, $B_{22}$, $C_{12}$, $C_{32}$, $C_{62}$. Třída $NO_X$ 3 (acc. EN 416-1/A1).

Infrared heaters HELIOS are intended for environment protected against weather impacts with the classification of climatic conditions class 3K5 acc. EN 60721-3-3 with temperature range from 0° to 35°C, for BNV premises acc. EN 1127-1. Installing infrared heaters as design C is possible, except of normal spaces also in areas intended for decommissioning and maintenance of vehicles. Such installation must be assessed by the competent authorities in accordance with the applicable regulations.

Infrared heaters cannot be installed in individual, row and collective garages, motor vehicle garages and operating rooms of fuel filling stations with fuel dispensers. Infrared heaters cannot also be installed in places where there is a risk of fire or explosion or high levels of flammable dust.

Infrared heaters are suspended under the ceiling or on the walls in the upper areas of the buildings so that the radiated beams point to the floor towards the heated residential zone. The surfaces of floors, walls, machines and other objects are heated by radiation and the surrounding air is heated from them.

The infrared heater HELIOS consists of the following main parts:

- **Burner box**
- **Exhaust box**
- **Reflector** with hinges and the radiant heating tubes "U" or "I"

The basic design of the burner box is scalded by the throat for the external suction in the upper part of the burner box. If the combustion air supply system is not connected, it is an open gas appliance. Thus, infrared heaters can only be used in a basic (normal) environment according to the according to the relevant standard. In order to be considered as a closed gas appliance, the radiator must be connected to outdoor air intake system.

## 3. Description of function

- Infrared heater operation is controlled by the **automatics** located in the burner box.
- After connecting to the el. network, first the basic test of the connected devices to the automatic is performed and if everything is OK, the exhaust fan is activated.
- After the fan starts and a vacuum is evoked in the burner chamber, the differential air manostat is switched. The manostat senses the pressure differential caused by the exhaust fan.
- When the manostat is switched on, the venting time (approx. 50 s) starts to run, this is used to ventilate the flue gas exhaust pipe and heating tubes.
- After this ventilation time, the electromagnetic double valve is opened and gas is injected into the burner. At the same time, the ignition system is put into operation by the automatic system.
- The ignition of the gas mixture in the burner is detected by the ionisation electrode.
- If the gas mixture in the burner is not ignited within 5 seconds, the valve closes the gas supply and the unburned gas / air mixture is vented through the exhaust fan during the next ventilation time. After it has elapsed, the automation runs two more ignition cycles.
- If no flame is detected during the third ignition cycle, the automatic switches into the fault mode and the red indicator “Burner Failure” light on.
- Further start is possible after unlocking the fault condition by disconnecting and reconnecting to the power supply.
- After putting the burner into operation and igniting the gas mixture, the green indicator "Power supply" and orange indicator "Burner Operation" lights up.

## 4. Versions

**According to power control of the burner, the infrared heaters are single-stage or two-stage.**

The atmospheric burner control is single-stage or two-stage.

Infrared heater with single-stage burner works in on-off mode, two-stage burner of the infrared heater operates in off mode - reduced power - full power.

The main advantages of the two-stage burner control include reducing burner start-up frequency, better temperature distribution in the heated space and reduced energy consumption.

Reflectors are supplied with insulation (thermal insulation, covered by a cover made of galvanized sheet metal).

## 5. Dimensions and weights

**Tab. 5.1 Weights of infrared heaters HELIOS-S**

| Type of infrared heater | Helios 33 SU(D)+ | Helios 50 SU(D)+ | Helios 70 SU(D)+ | Helios 100 S(D)+ | Helios 70 SI(D)+ |
|---|---|---|---|---|---|
| Weight [kg] | 244,0 | 392,5 | 392,5 | 547,5 | 304,7 |
| Length [m] | 10,8 | 14,8 | 14,8 | 21,5 | 20,2 |

**Dimensions and weights of two-stage heaters (U+, U/15+, LU+, LU/15+) are the same as for single-stage heaters (On-Off).**

**Fig. 1 Reflestor cross section of HELIOS SU(D)+**

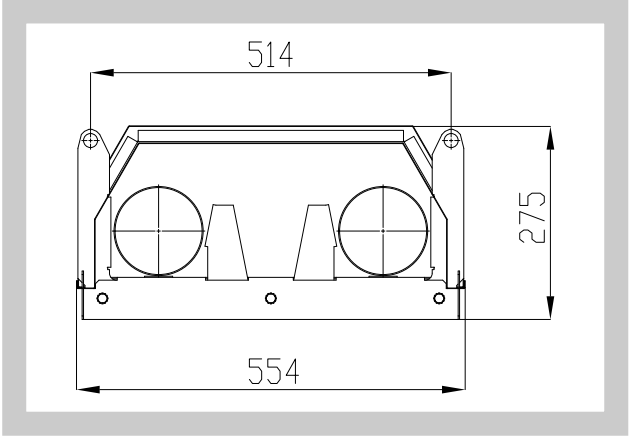
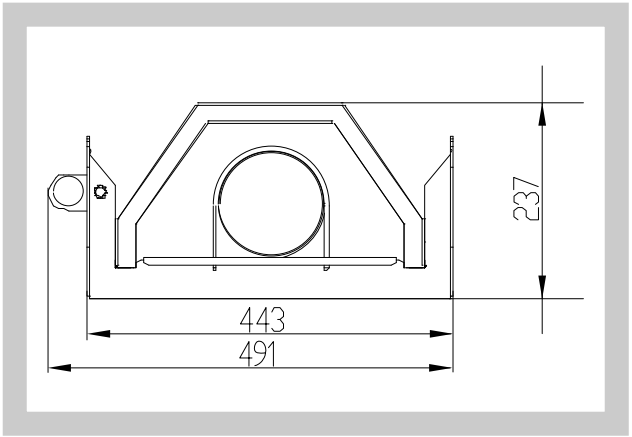
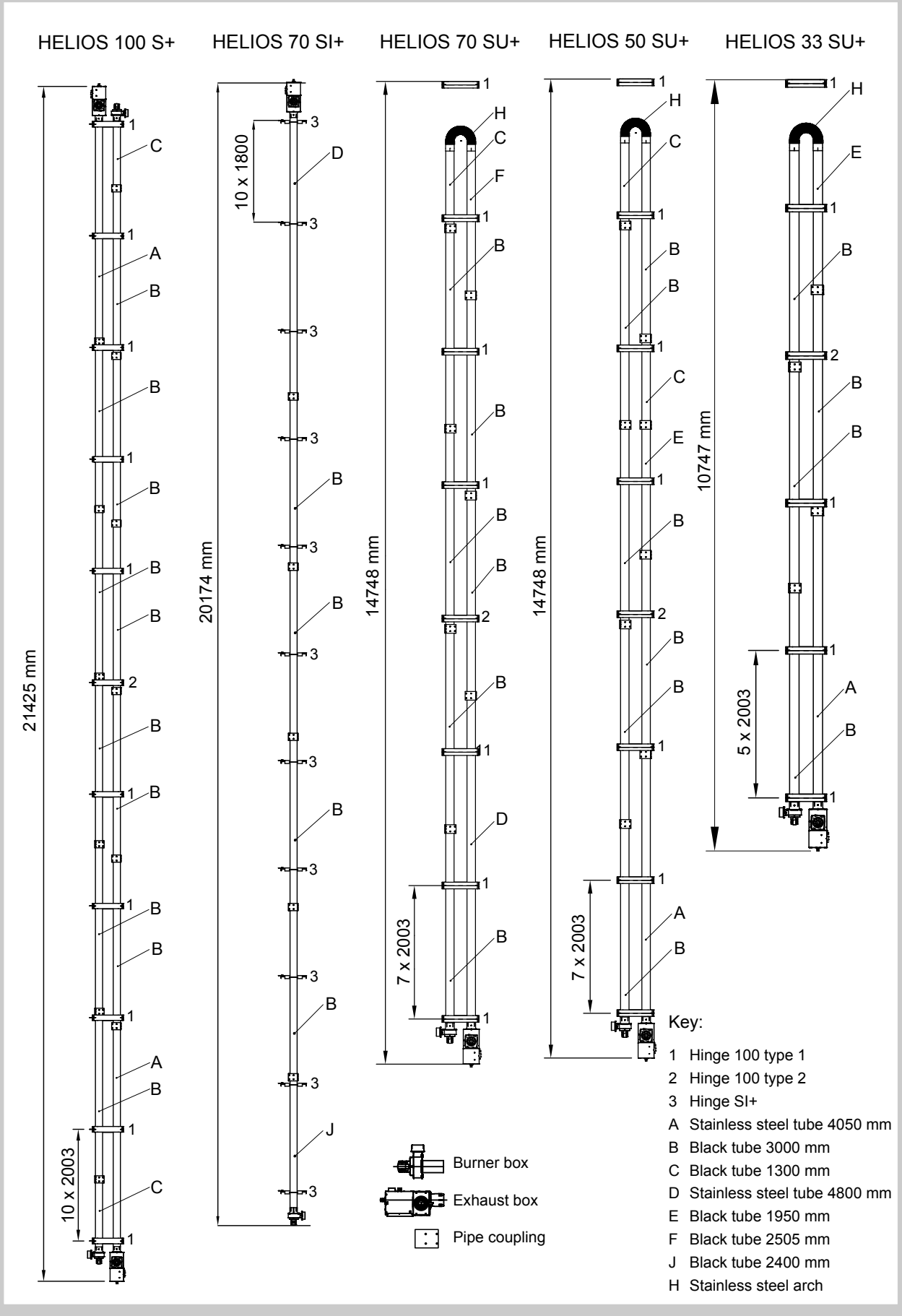



**Fig. 2 Reflestor cross section of HELIO SI(D)+**



## 6. Scheme of infrared heaters

**Fig. 3 Scheme of infrared heaters HELIOS-S**

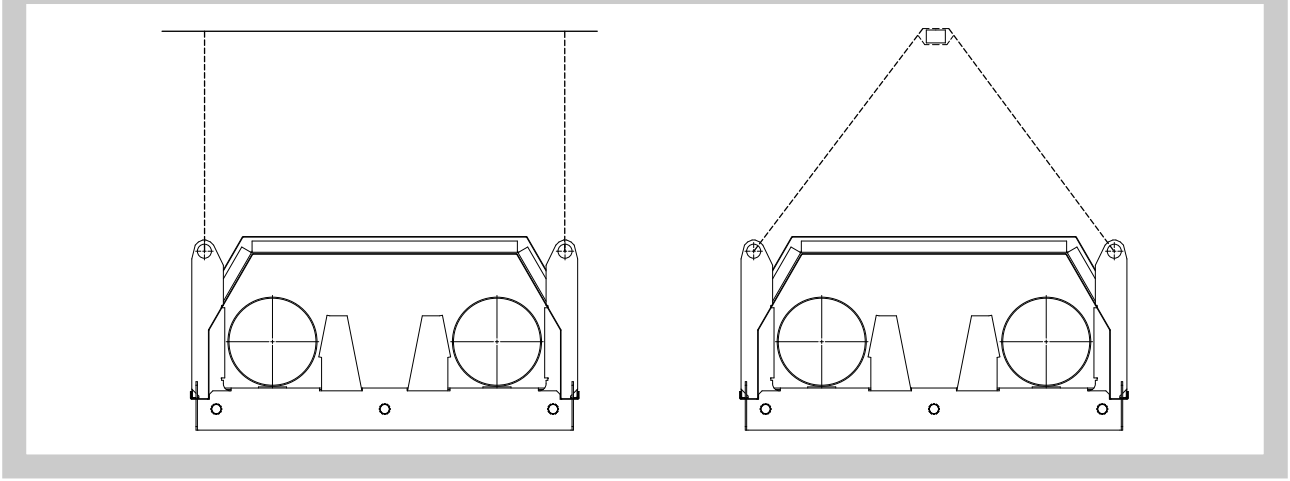


## IV. INSTALLATION

Suspension methods:

1. Dark tube infrared heaters can be suspended on suitable structure by means of chains or strings and snap-hooks or tie rods.
2. According to the picture 4 it is necessary to fix the infrared heater at least on two places by using an appropriate way so that the device cannot be turned around.
3. Due to the thermal expansion, the infrared heater can not be fixed directly to the supporting structure.
4. It is necessary to keep safe distance from flammable objects and walls (Fig. 5, 6).

**Fig. 4 Suspension of infrared heaters HELIOS-S**



**Special causes of installation**

When installing the heater over the runway of bridge crane, it is necessary to use the protection of electrical power installation of the crane against excessive heat. **If installed in gyms, we recommend installation of safety grille - it can be ordered with the heater from the manufacturer.**

**Fig. 5 Minimal safe distance of the infrared heater from walls, ceilings and flammable objects**

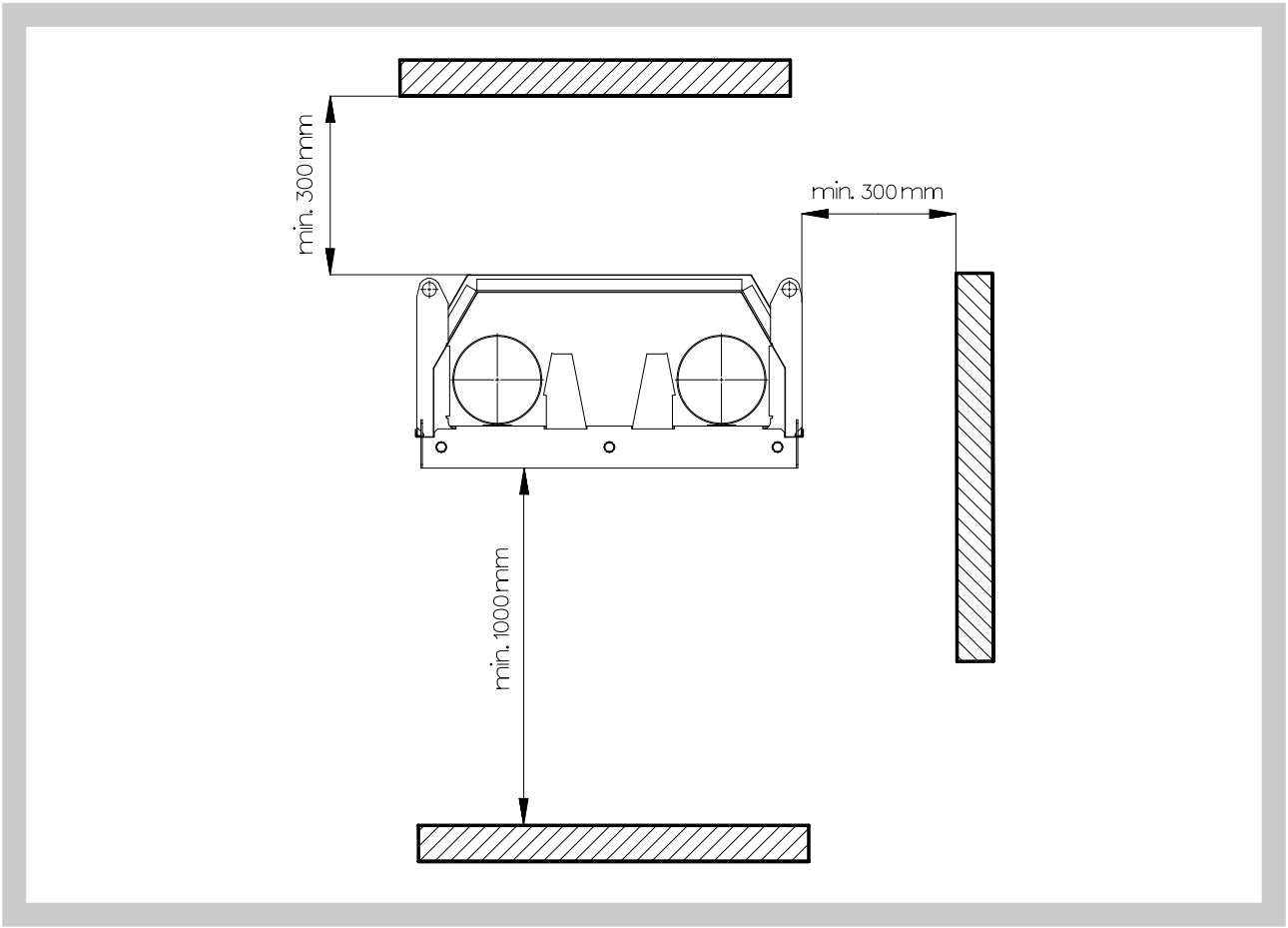
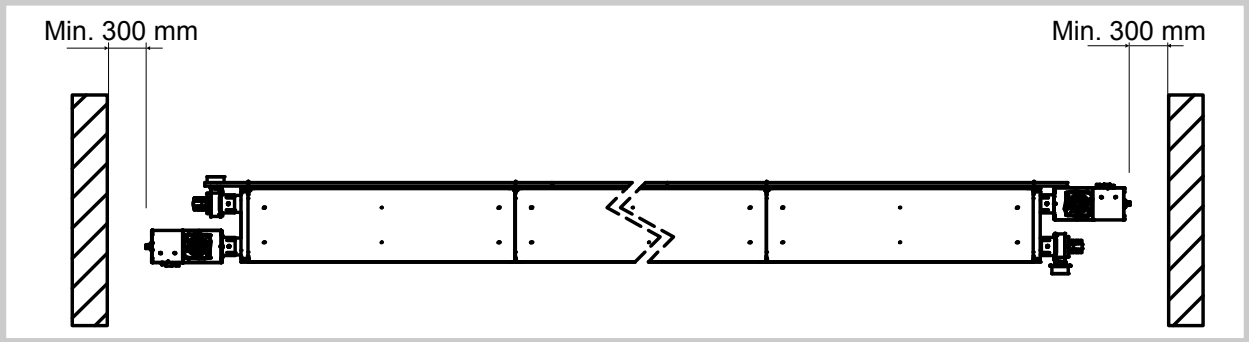


Fig. 6 Minimum safe distance of the infrared heater from walls and flammable objects




## V. FLUE GAS EXHAUST – CONNECTION PRINCIPLES

The flue gas duct must be in accordance with applicable standards and regulations.

1. Minimum internal diameter of the pipeline is 125 mm.
2. Connecting of the combustion gases to the ventilator must be demountable.
3. The duct system must prevent the condensate from penetration into the exhaust pipeline.
4. The duct system must be terminated freely in the exposed position so that the flue gases cannot face any resistance, and also that combustion cannot return back to the building through windows.
5. The material of flue gases exhaust must be resistant to corrosion and against flue gases temperature according to relevant standards.
6. Opening for flue gases measurement is placed according to heater configuration, for heaters without economizer the opening is in the first part of the duct immediately after the heater, for heaters with economizer, the opening is in the first part of the flue duct immediately after the economizer.

Tab. 6.1 Table for selection of minimum diameter of flue gas and combustion air supply duct

| Type of infrared heater | Coaxial chimney - Aluminium | Separate pipeline - Aluminium | Coaxial chimney - Stainless steel | Separate pipeline - Stainless steel |
|---|---|---|---|---|
| **Helios 33 SU+** | DN 125 | DN 125 | DN 130 | DN 130 |
| **Helios 50 SU+** | - | DN 125 | DN 130 | DN 130 |
| **Helios 70 SU+** | - | DN 125 | DN 150 | DN 130 |
| **Helios 70 SI+** | - | DN 125 | - | DN 130 |
| **Helios 100 S+** | - | DN 125 | DN 130 | DN 130 |

**After specifying the exhaust gas components and the combustion air intake components, it is necessary to calculate total pressure loss of the pipeline.**
**The sum of the pressure loss values of the supply and exhaust pipes must not exceed 50 Pa.**
**If the total pressure loss of the pipeline is higher, it is necessary to use a larger pipe diameter.**

### 7. Pressure losses

For pressure losses of individual flue system components see following tables.
Total pressure loss of flue system can be calculated as sum of pressure losses of all components used.

Tab. 7.1 Pressure losses of components for exhausting flue gases and suction of the air – stainless steel system

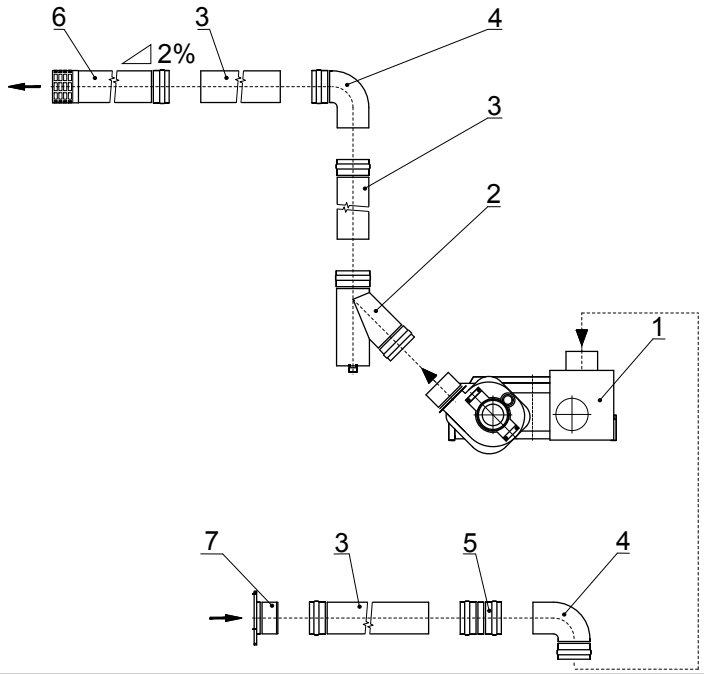
| Helios | Nominal dimension (mm) | Pressure loss (Pa) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tube 1 bm | Bend 45° | Bend 90° | Conden-sate trap 45° | Conden-sate trap 90° | Coaxial chimney horizont. | Coaxial chimney vertical | Exhaust head Horizont. | Exhaust head vertical | Air intake head | Flexo INOX 1 bm | Flexo AL pipe 1 bm |
| **33 SU+** | **DN 130** | 1,0 | 1,5 | 3 | 3,5 | 7 | 16 | 18 | 4,5 | 5,5 | 6,5 | 3 | 5 |
| | **DN 150** | 1 | 1 | 2 | 2 | 4 | 9 | 12 | 3 | 4 | 4 | 2 | 2 |
| **50 SU+** | **DN 130** | 2 | 3 | 6 | 6 | 12 | 27 | 32 | 7 | 9 | 12 | 9 | 6 |
| | **DN 150** | 1 | 2,0 | 3,5 | 5,0 | 5,0 | 17 | 19 | 4,0 | 5,0 | 6,0 | 3,5 | 3,5 |
| **70 S+** | **DN 130** | 3,5 | 4,5 | 7 | 9 | 14 | 33 | - | 10 | 12 | 14 | 7 | 9 |
| | **DN 150** | 2,5 | 3,5 | 5 | 6,0 | 10 | 25 | 28 | 7 | 9 | 10 | 5 | 6 |
| **100 S+** | **DN 130** | 2 | 3 | 6 | 6 | 12 | 27 | 32 | 7 | 9 | 12 | 9 | 6 |
| | **DN 150** | 1 | 2 | 3,5 | 5 | 5 | 17 | 19 | 4 | 5 | 6 | 3,5 | 3,5 |

**Tab. 7.2 Pressure losses of components for exhausting flue gases and suction of the air – Aluminium system**

| Helios | Nominal dimension (mm) | Pressure loss [Pa] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tube 1 bm | Bend 45° | Bend 90° | Conden-sate trap 45° | Conden-sate trap 90° | Coaxial chimney horizont. | Coaxial chimney vertical | Exhaust head Horizont. | Exhaust head vertical | Flexo Al pipe 1 bm |
| **33 SU+** | DN 125 | 2 | 3,5 | 5 | 6,0 | 10 | 20 | 21 | 8 | 9 | 5 |
| **50 SU+** | DN 125 | 4 | 6 | 9 | 10 | 16 | - | - | 15 | 16 | 9 |
| **70 S+** | DN 125 | 4,5 | 6 | 9 | 12 | 18 | - | - | 13 | 15,5 | 9 |
| **100 S+** | DN 125 | 4 | 6 | 9 | 10 | 16 | - | - | 15 | 16 | 9 |

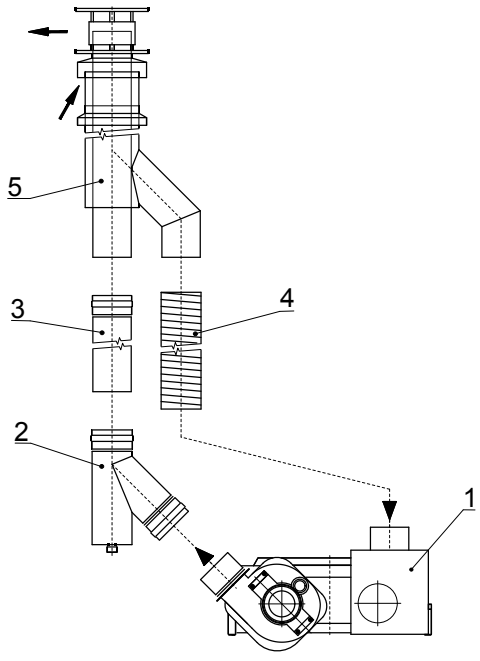
## 8. Examples of flue gas exhaust and combustion air supply solutions

**Fig. 7 Gases exhaust through the wall with condensate trap**



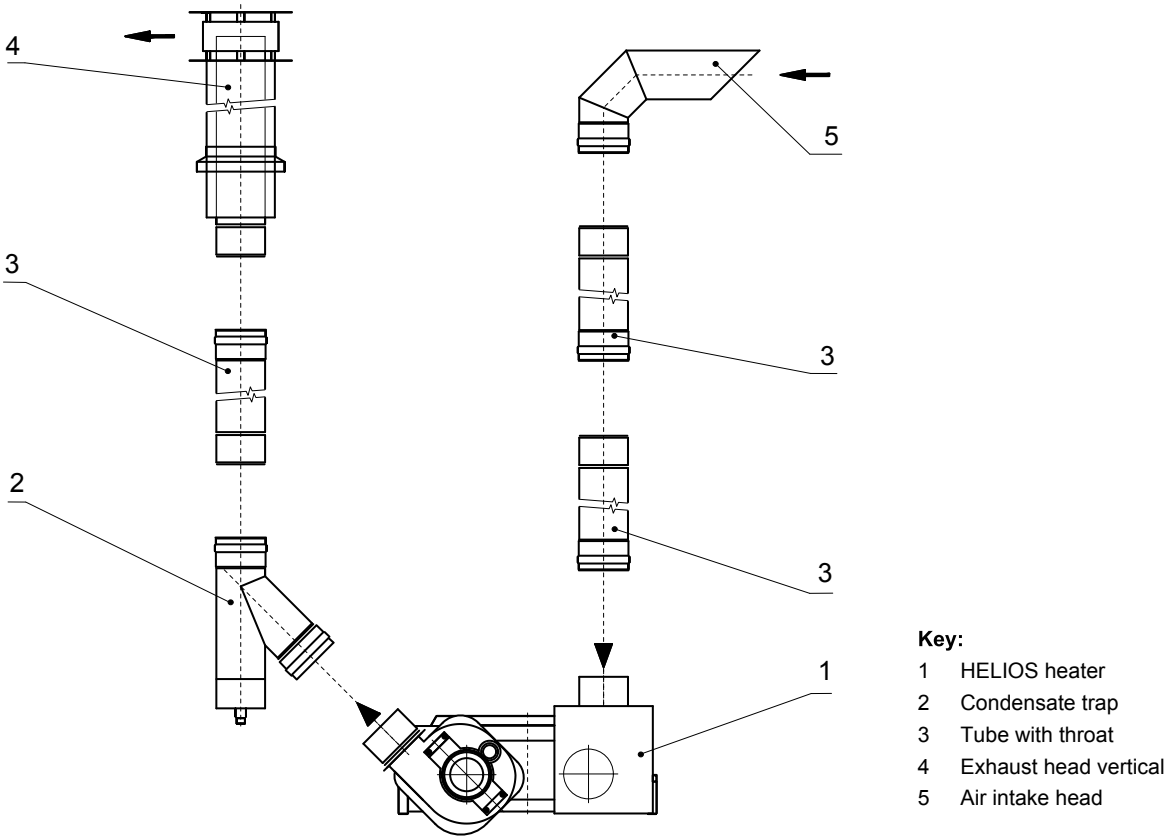

**Key:**
1 HELIOS heater
2 Condensate trap
3 Tube with throat
4 Bend
5 Join female-female
6 Exhaust head horizontal
7 Air intake head

**Fig. 8 Gases exhaust and air intake with coaxial chimney over the roof**



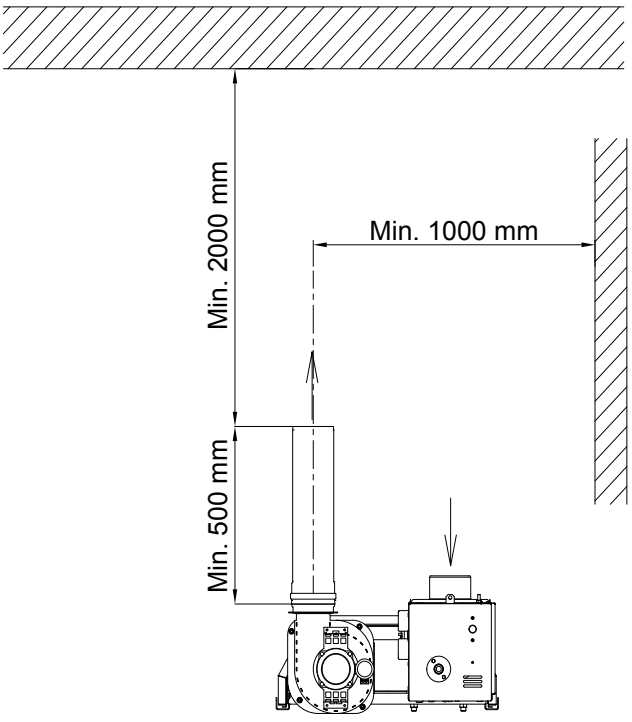

**Key:**
1 HELIOS heater
2 Condensate trap
3 Tube with throat
4 Flexible duct Al
5 Coaxial chimney vertical

**Fig. 9 Gases exhaust and air intake with separate ducts over the roof**




## Design $A_2$

**Fig. 10 Distances from the flue gas outlet of the infrared heater in the version $A_2$**




The flue gas exhaust is forced by the flue gas duct inside the building. The appliance is classified according to the flue into design version $A_2$. The design and installation of the flue gas exhaust must comply according the correct norm.

When installing the heater in design $A_2$ in enclosed space, it is necessary to ensure forced ventilation with min. 10 $m^3$/ h for each installed kW power consumption of the heater in design $A_2$ and it is necessary to ensure that the device will stop in the case of non-functional ventilation.

If inclined heaters are installed, rotate the exhaust cabinet so that the flue gas is directed vertically upwards.

# VI. TECHNICAL DATA

## 9. Technical parameters

Tab. 9.1 Technical parameters of two-stage infrared heaters HELIOS-S

| Type of infrared heater | 100 SD+ | 70 SUD+ | 70 SID+ | 50 SUD+ | 33 SUD+ |
|---|---|---|---|---|---|
| Nominal input power ZP G20 [kW] | 2 x 49,5 | 75,2 | 75,2 | 49,5 | 36,0 |
| Nominal input power ZP G25 [kW] | 2 x 46,0 | 60,1 | 60,1 | 46,0 | 33,5 |
| Minimal input power ZP G20 [kW] | 2 x 43,5 | 66,2 | 66,2 | 43,5 | 31,7 |
| Minimal input power ZP G25 [kW] | 2 x 43,0 | 52,9 | 52,9 | 43,0 | 29,5 |
| Nominal output power ZP G20 [kW] | 2 x 44,6 | 67,8 | 67,7 | 44,6 | 32,4 |
| Nominal output power ZP G25 [kW] | 2 x 41,4 | 54,3 | 54,2 | 41,4 | 30,2 |
| Minimal output power ZP G20 [kW] | 2 x 38,3 | 58,3 | 58,3 | 38,4 | 29,5 |
| Minimal output power ZP G25 [kW] | 2 x 36,4 | 46,6 | 46,6 | 36,4 | 27,9 |
| El. connection [V/Hz] | 230/50 | | | | |
| El. power input [W] | 200 | 250 | 250 | 100 | 100 |
| Protection [A] | 4 | | | | |
| Operating pressure ZP [mbar] | 17 - 26 | | | | |
| Gas consumption at nominal output power ZP G20 [$m^3 \cdot h^{-1}$] | 10,36 | 7,81 | 7,81 | 5,18 | 3,75 |
| Gas consumption at nominal output power ZP G25 [$m^3 \cdot h^{-1}$] | 10,70 | 7,81 | 7,81 | 5,35 | 3,89 |
| Gas consumption at minimal output power ZP G20 [$m^3 \cdot h^{-1}$] | 9,04 | 6,87 | 6,87 | 4,52 | 3,30 |
| Gas consumption at minimal output power ZP G25 [$m^3 \cdot h^{-1}$] | 9,42 | 6,87 | 6,87 | 4,71 | 3,42 |
| Nozzle diameter ZP [mm] | 6,4 | 7,4 | 7,4 | 6,4 | 5,0 |
| Nozzle pressure at nominal output power ZP G20 [mbar] | 9,0 | 9,0 | 9 | 9 | 11,5 |
| Nozzle pressure at nominal output power ZP G25 [mbar] | 12 | 9 | 9 | 12 | 14,0 |
| Nozzle pressure at minimal output power ZP [mbar] | 7,5 | 7,5 | 7,5 | 7,5 | 9,0 |
| Nozzle pressure at minimal output power ZP G25 [mbar] | 8,5 | 7,5 | 7,5 | 8,5 | 10,0 |
| Length of infrared heater [m] | 21,5 | 14,8 | 20,2 | 14,8 | 10,8 |
| Weight of infrared heater [kg] | 547,5 | 392,5 | 304,7 | 392,5 | 244,0 |
| Gas connection | 2x G 3/4" | G 3/4" | G 3/4" | G 3/4" | G 3/4" |
| Flue gas connection | 2 x DN130 | DN 130 | DN 130 | DN 130 | DN 130 |
| Flue gas fan (maximal values) | 350 $m^3 \cdot h^{-1}$ | 650 $m^3 \cdot h^{-1}$ | 650 $m^3 \cdot h^{-1}$ | 350 $m^3 \cdot h^{-1}$ | 350 $m^3 \cdot h^{-1}$ |
| | 360 Pa | 610 Pa | 610 Pa | 360 Pa | 360 Pa |

Tab. 9.2 Technical parameters of one-stage infrared heaters HELIOS-S

| Type of infrared heater | 100 S+ | 70 SU+ | 70 SI+ | 50 SU+ | 33 SU+ |
|---|---|---|---|---|---|
| Nominal input power ZP G20 [kW] | 2 x 49,5 | 75,2 | 75,2 | 49,5 | 36,0 |
| Nominal input power ZP G25 [kW] | 2 x 46,0 | 60,1 | 60,1 | 46,0 | 33,5 |
| Nominal output power ZP G20 [kW] | 2 x 44,6 | 67,8 | 67,7 | 44,6 | 32,4 |
| Nominal output power ZP G25 [kW] | 2 x 41,4 | 54,3 | 54,2 | 41,4 | 30,2 |
| El. connection [V/Hz] | 230/50 | | | | |
| El. power input [W] | 200 | 250 | 250 | 100 | 100 |
| Protection [A] | 4 | | | | |
| Operating pressure ZP [mbar] | 17 - 26 | | | | |
| Gas consumption at nominal output power ZP G20 [$m^3 \cdot h^{-1}$] | 10,36 | 7,81 | 7,81 | 5,18 | 3,75 |
| Gas consumption at nominal output power ZP G25 [$m^3 \cdot h^{-1}$] | 10,70 | 7,81 | 7,81 | 5,35 | 3,89 |
| Nozzle diameter ZP [mm] | 6,4 | 7,4 | 7,4 | 6,4 | 5,0 |
| Nozzle pressure at nominal output power ZP G20 [mbar] | 9,0 | 9,0 | 9 | 9 | 11,5 |
| Nozzle pressure at nominal output power ZP G25 [mbar] | 12 | 9 | 9 | 12 | 14,0 |
| Length of infrared heater [m] | 21,5 | 14,8 | 20,2 | 14,8 | 10,8 |
| Weight of infrared heater [kg] | 547,5 | 392,5 | 304,7 | 392,5 | 244,0 |
| Gas connection | 2x G 3/4" | G 3/4" | G 3/4" | G 3/4" | G 3/4" |
| Flue gas connection | 2 x DN130 | DN 130 | DN 130 | DN 130 | DN 130 |
| Flue gas fan (maximal values) | 350 $m^3 \cdot h^{-1}$ | 650 $m^3 \cdot h^{-1}$ | 650 $m^3 \cdot h^{-1}$ | 350 $m^3 \cdot h^{-1}$ | 350 $m^3 \cdot h^{-1}$ |
| | 360 Pa | 610 Pa | 610 Pa | 360 Pa | 360 Pa |

## 10. Material, surface treatment

Reflectors of infrared heaters are made of aluminised sheet metal. In insulated version they are equipped with thermal insulation from mineral wool boards, covered with galvanized sheet. The hinges, sockets and couplings are made of steel plates with heat-resistant coating. The casing of the burner casing is made of galvanized sheet steel, powder-coated on the outside. Radiant tubes are steel, dark aluminised.

# VII. CHECKING AND TESTING

## 11. Control

The equipment is checked and preset by the manufacturer, its operation depends on correct installation and adjustment.

# VIII. LOGISTIC DATA

## 12. Logistic data

Infrared heaters and its accessories are provided with packaging foil and packed in cardboard boxes. They are transported with covered vehicles without the direct influence of the weather. There must be no vibration and the ambient temperature must not exceed + 50 ° C. When handling during transport and storage, infrared heaters and accessories must be protected against mechanical damage. Infrared heaters must be stored in covered buildings, in an environment free from aggressive vapours, gases and dust. The delivery includes a complete HELIOS infrared radiator, enclosed quality and completeness certificate with inspection stamp and installation, operation and maintenance instructions.

# IX. PRODUCT DATA

## 13. Data label

**Fig. 11 Product data label (on burner box):**

MANDÍK, a.s. Hostomice 550
267 24 Hostomice Czech Republic

DARK GAS-FIRED INFRARED HEATER

| | | | |
|---|---|---|---|
| TYPE: | | FUEL: | |
| OUTPUT POWER MAX: | | VOLTAGE: | |
| OUTPUT POWER MIN: | | EL. INPUT POWER: | |
| GAS CONSUMPTION MAX: | | PROTECTION: | |
| FUEL GAUGE PRESSURE: | | WEIGHT: | |
| GAS CONSUMPTION MIN: | | CATEGORY: | |
| SER. NUMBER: | | | |

Certified: EC Type Examination Certificate No. E-30-00546-10,CE-1015CL413

# X. INSTALLATION CONDITIONS

Before starting installation, make sure that local condition regarding gas line, fuel and its pressure and heater setting are compatible.
Installation of the heater must be carried out in such way so that an adequate space for servicing and adjustment is maintained (Fig. 5, 6). There must be ensured sufficient air exchange in the building to allow for good combustion of gas. The amount of combustion air for the infrared heaters must meet applicable standards. For installation of heaters in dusty environment, installation of duct supplying the combustion air from outside (Closed appliance) is strongly recommended. The installation must comply with applicable standards and regulations and with this installation manual.

**Installation of the infrared heater may be done by authorized person only!**
**Surface temperature of the radiant pipe may exceed 500°C!**

Infrared heaters cannot be installed in places where there is a risk of fire or explosion or high levels of flammable dust. **Using the heaters in a corrosive environment is prohibited!**

Infrared heaters HELIOS-S can be used for heating in public areas where this type of heating is permitted by legislation. It is necessary to comply with the regulations for installation in these areas.

## 14. Mounting components of infrared heater HELIOS-S

**Individual assembly components of the infrared heater HELIOS-S:**

- Burner box
- Exhaust (ventilation) box
- Connecting cable with connector
- Radiant pipes
- Pipe connections, arch
- Hinges with fixing straps
- Reflectors
- Connecting material

**Other components (are not included in the infrared heater supply!):**

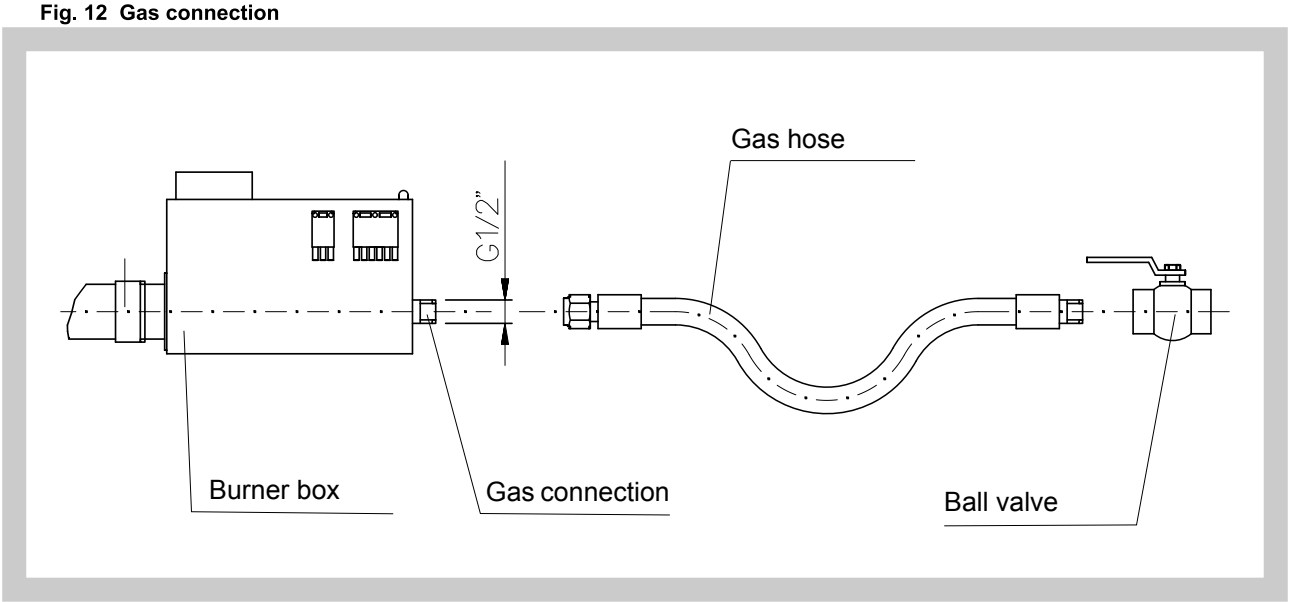
- Remote control box, connecting cables
- Accessories, auxiliary fastening and connecting material
- Venting or combustion air inlet pipeline

## 15. Gas connection installation

Installation of gas connection must be carried out according to applicable standards and regulations (see. Chap. XI). Pipeline must be ended by a gas ball valve near the joining point of the infrared heater – max. 1.5 m (Fig. 12). When the infrared heater is in operation, there must be stable and unwavering gas pressure guaranteed in the pipeline - NG, P, see tab. 9.1 and 9.2. For the connection itself, flexible gas hose is used. Since the hose withstands the temperatures up to 100 °C, it is necessary to avoid any contact of the hose with the heater outside the points of connection. The gas lines must be prepared so as to avoid any contact with direct flame and radiant heat.

Connecting the infrared heater can be carried out only by an authorized person. The gas hose is subject to periodic revisions as the gas distributions. It is necessary to protect the hoses from mechanical stresses and aggressive media. The hoses must not be subjected to any tension.

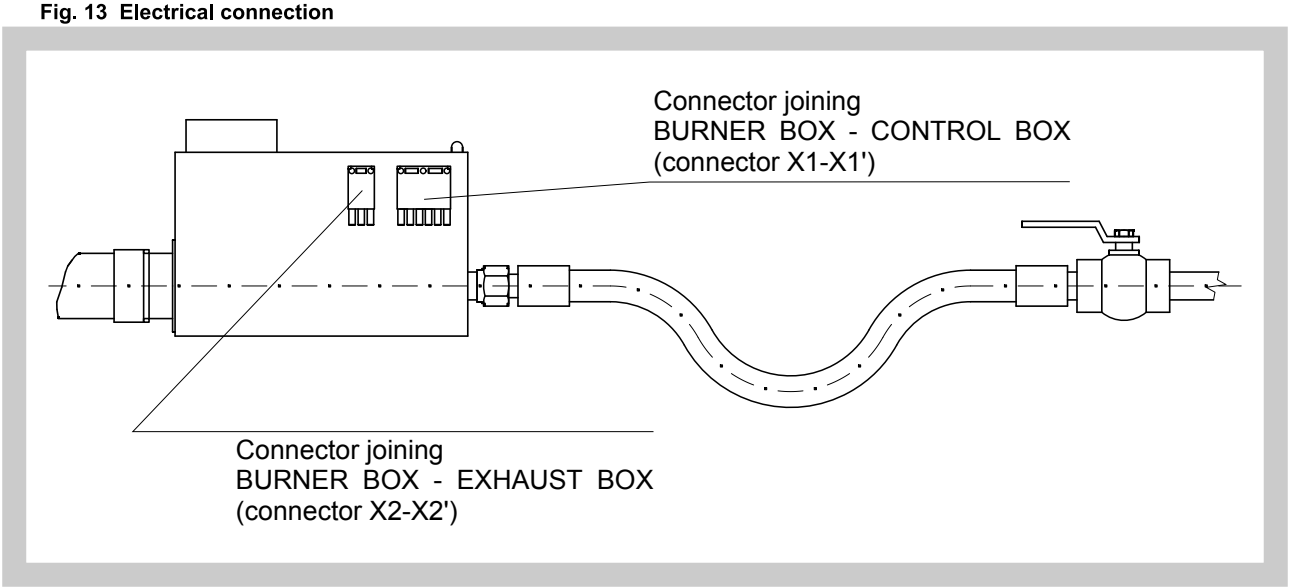
**Fig. 12 Gas connection**




## 16. Electrical installation

Place the box of remote control according to the project so that it is freely accessible for the servicing staff. Connection of the box for remote control to the main supply distribution of 230V/50Hz must be carried out firmly using suitable three-wire cable. Connection of the box of remote control to the heater must be carried out firmly by the five-wire cable or seven-wire cable if all signals are to be transferred. Then connect the cable to the terminal piece according to the relevant wiring diagram (Fig. 14-16). Installation of electrical connections must be made by an authorized person according to applicable standards and regulations. The installation must include test of functionality and electric revision.

**Fig. 13 Electrical connection**



## XI. CONTROL

### 17. Control box

**Control by Thermostat**
Enables control of single heater based on temperature or temperature programmed by weekly program.

**OI control box**
OI enables manual control of one (OI 1) to six (OI 6) one-stage or two-stage tube heaters HELIOS-S. The control box has IP 40 rating and it can be equipped with programmable room thermostat TP08 (IP 30). The load selection of two-stage heaters is manual.

**OID control box**
OID enables automatic and manual control of one (OID 1) to six (OID 6) one-stage or two-stage tube heaters HELIOS-S. The control box has IP 40 rating. The control box is equipped with UC301 (IP 20) regulator with time programme. The load selection of two-stage heaters automatic. The UC301 is a communication two-stage regulator for gas heaters with SSR outputs. It can work autonomously or be connected to a primary regulator (MiniPLC or SoftPLC), visualization (RcWare Vision or other SCADA system) or UCWEB web interface.

**Fig. 14 Diagram of controlling the infrared heater HELIOS-S by thermostat**

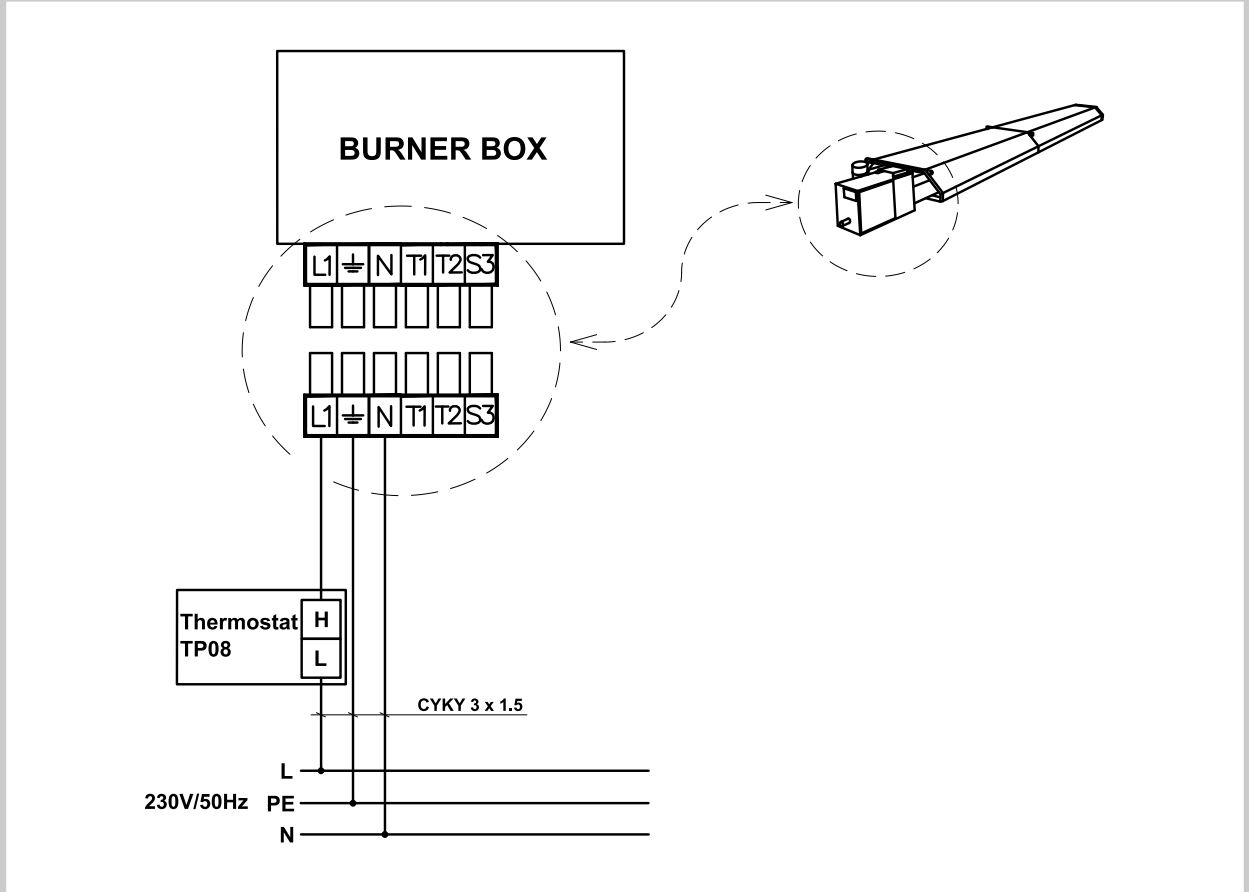


Fig. 15 Diagram of controlling the infrared heater HELIOS-S by control box OI

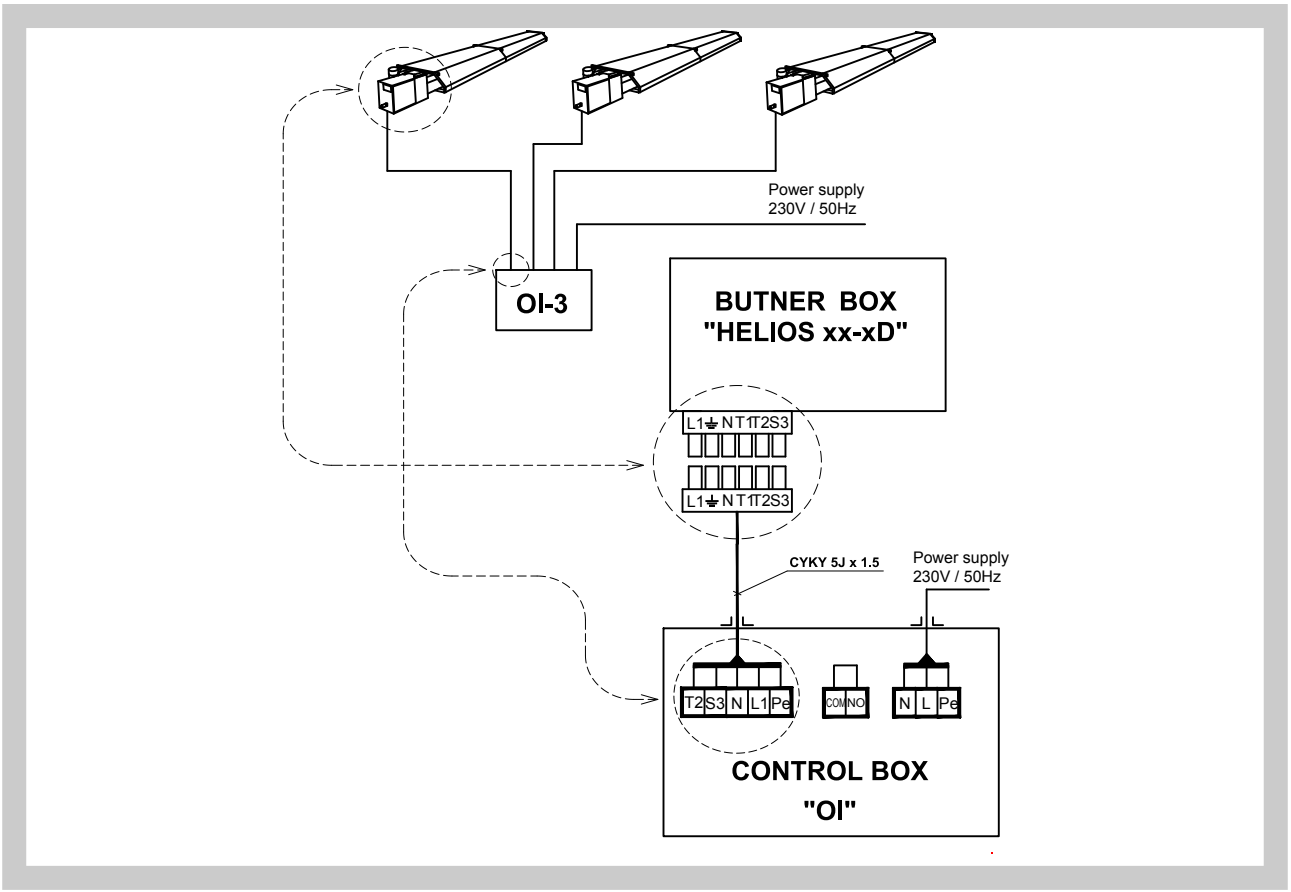
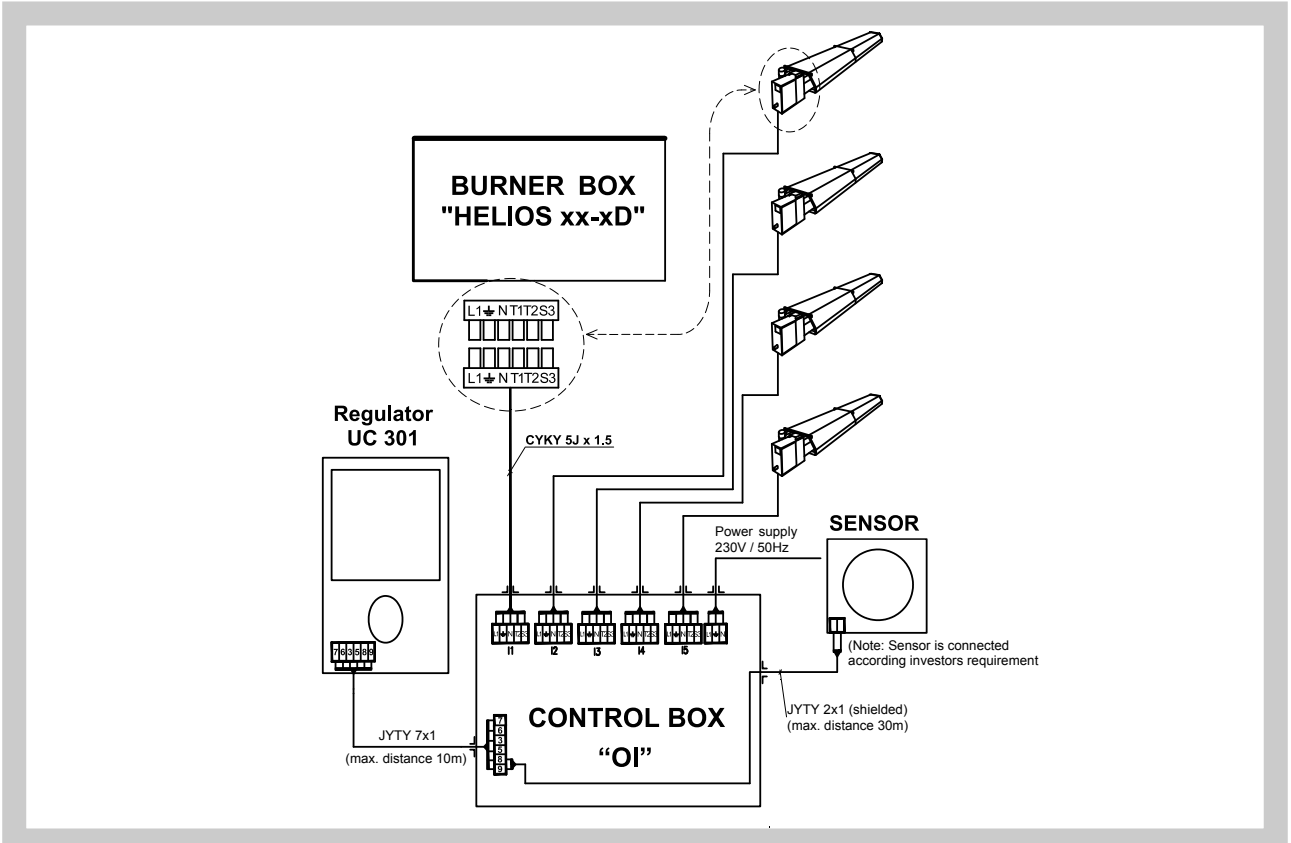



Fig. 16 Diagram of controlling the infrared heater HELIOS-S by control box OID

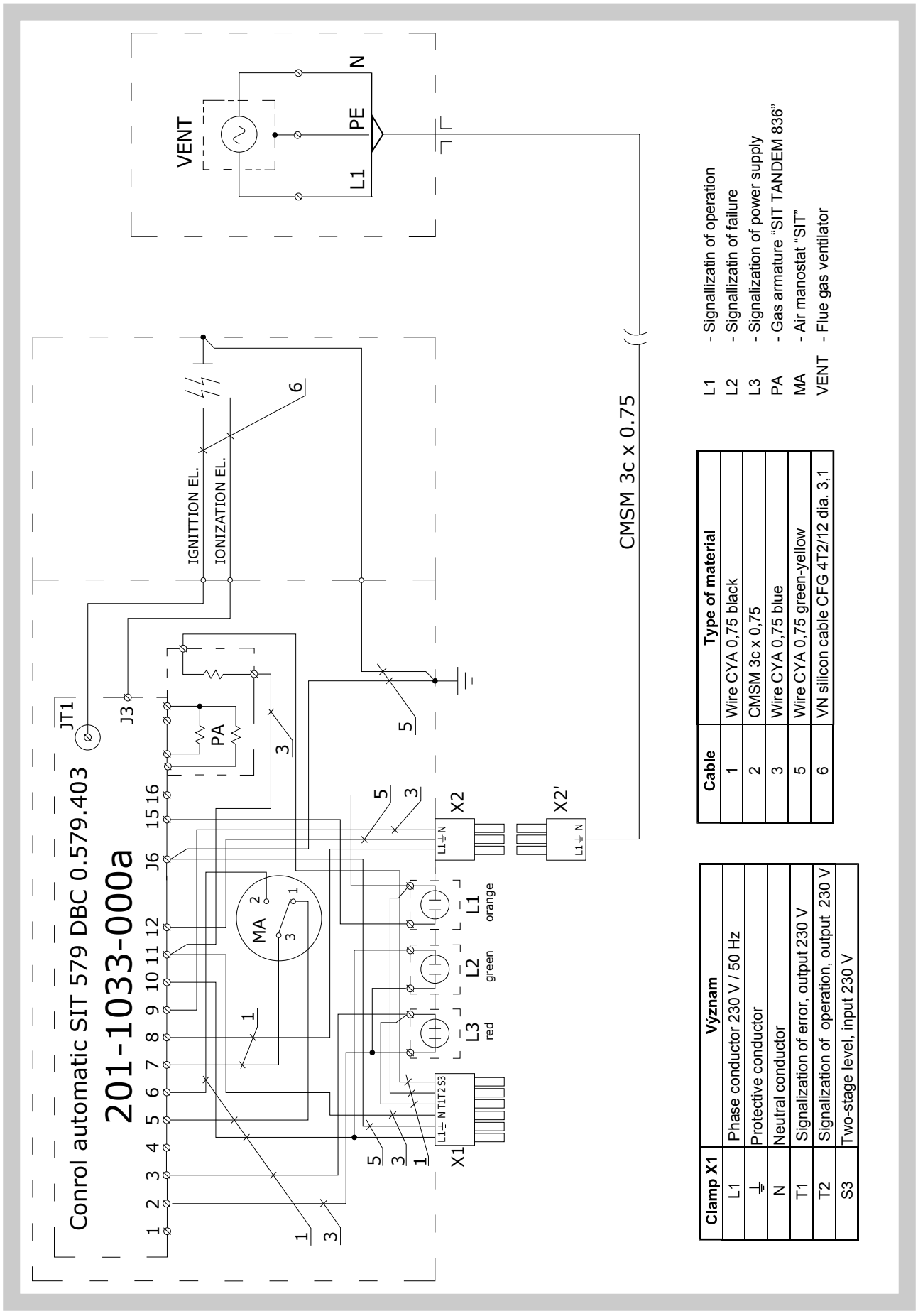



## Temperature sensor placement

Temperature sensor or thermostat should be placed into the working zone, 1,5 m above the floor. Preferable placement avoids outer cooled wall of the building. If the above placement is not possible, suitable temperature correction has to be added to the programmed temperatures.

## 18. Wiring diagram

**Fig. 17 Internal wiring diagram for HELIOS-S**




| Cable | Type of material |
|---|---|
| 1 | Wire CYA 0,75 black |
| 2 | CMSM 3c x 0,75 |
| 3 | Wire CYA 0,75 blue |
| 5 | Wire CYA 0,75 green-yellow |
| 6 | VN silicon cable CFG 4T2/12 dia. 3.1 |

| Clamp X1 | Význam |
|---|---|
| L1 | Phase conductor 230 V / 50 Hz |
| ⏚ | Protective conductor |
| N | Neutral conductor |
| T1 | Signalization of error, output 230 V |
| T2 | Signalization of operation, output 230 V |
| S3 | Two-stage level, input 230 V |

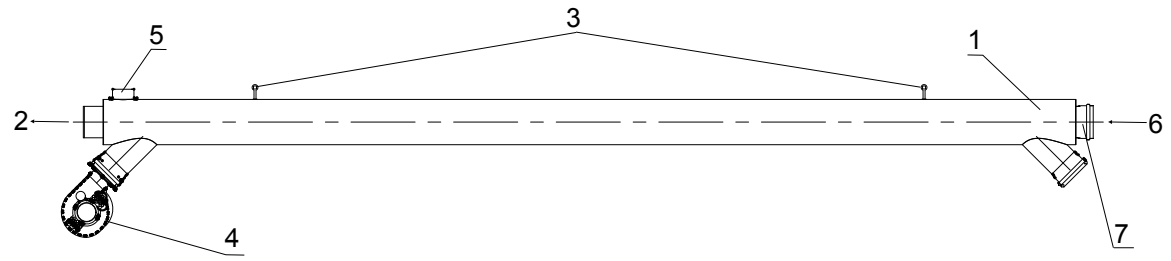
## XII. ECONOMIZER AWTM

Economizer is a counterflow heat exchanger which utilizes residual heat of flue gases for air heating. It consists of the heat exchanger itself, air fan and flange on the heated air exit. The internal heat transfer surface of the exchanger is made of aluminium, the external surface is made of galvanized steel plate. To the external surface of heat exchanger, there are connected air fan and air output neck with flange 125 mm. The flange is used for connecting a grille with adjustable blades to blow the heated air into the heated room or for connecting an air-duct transferring the heated air into another room. The internal heat transfer surface has a standard 125 mm socket for connection to flue gases output of HELIOS tube heater and DN 125 mm neck for connection to the socket of condensate trap and further to flue system. Economizer is placed in flue system immediately after the tube heater.
Electric supply of the fan can be from connector on the burner box or by cable from mains 230V/50Hz.

### 19. Economizer functional description

When the heater is started, the flue gases flow inside the internal heat transfer surface and heat it up. As soon as the surface temperature reaches 42°C, the air fan is started and blows the air between the internal heat transfer surface and external casing, the heated air goes out via the neck with connected grille or duct. If the temperature of internal surface decreases bellow 30°C, the air fan stops.

**Pic. 18 Economizer AWTM**




**Key:**

| | | | |
|---|---|---|---|
| 1 Casing | 3 Hanging point | 5 Electric terminal box | 7 Socket DN125 |
| 2 Flue output | 4 Air fan | 6 Flue input | |

### 20. Pressure loses on flue gas side

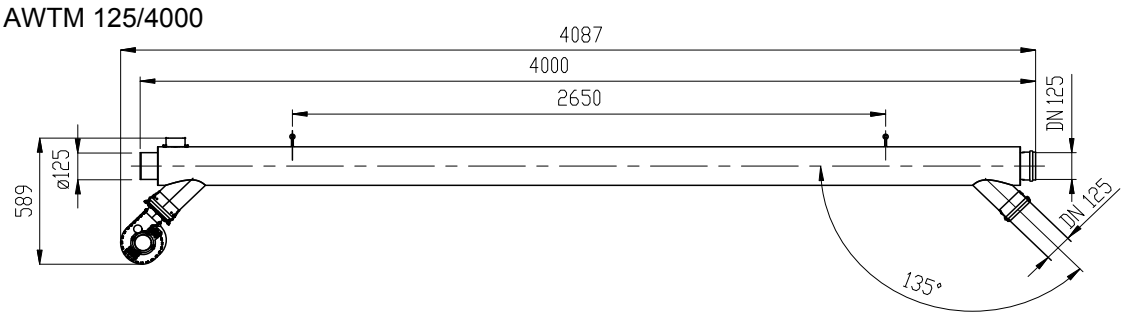
**Tab. 20.1 Pressure loss of economizer AWTM on flue gasses side when connected to HELIOS-S heaters**

| Type | Helios 50 S+ | Helios 70 SU+ | Helios 70 SI+ | Helios 100 S+ |
|---|---|---|---|---|
| AWTM 125/4000 | 10 Pa | 18 Pa | 18 Pa | 10 Pa |

**Usable pressure for connection to air duct is 35 Pa.**

### 21. Dimensions of economizer

**Pic. 19 Economizer AWTM - dimensions**

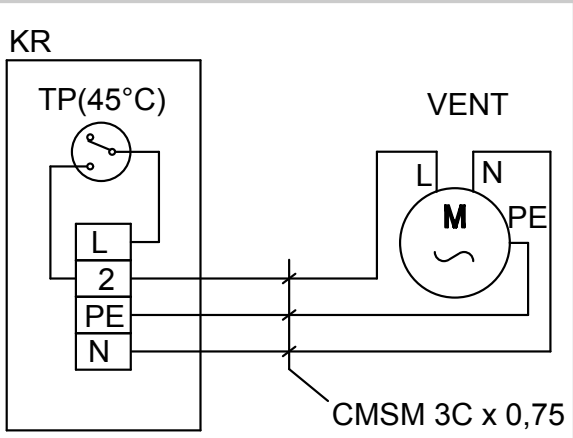


## 22. Technical data and wiring diagram of economizer

**Tab. 22.1 Technical data**

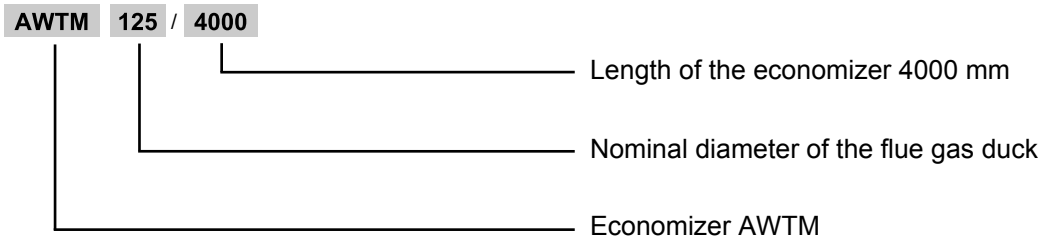
| Type | AWTM 125/4000 |
|---|---|
| Length [mm] | 4087 |
| Weight [kg] | 47 |
| Power supply [V/Hz] | 230/50 |
| Electric input [W] | 75 |
| Air flow [m³/h] | 750 |
| Thermal output with Helios 50 S+ | 2300 W |
| Thermal output with 70 SU+ | 2600 W |
| Thermal output with Helios 70 SI+ | 2700 W |
| Thermal output with Helios 100 S | 2300 W |
| Available pressure | 35 Pa |

**Pic. 20 Economizer AWTM wiring diagram**




The thermal output of economizer depends on the heater adjustment and air temperature.
The above data are for correctly adjusted heaters working on natural gas and air temperature of 20°C.

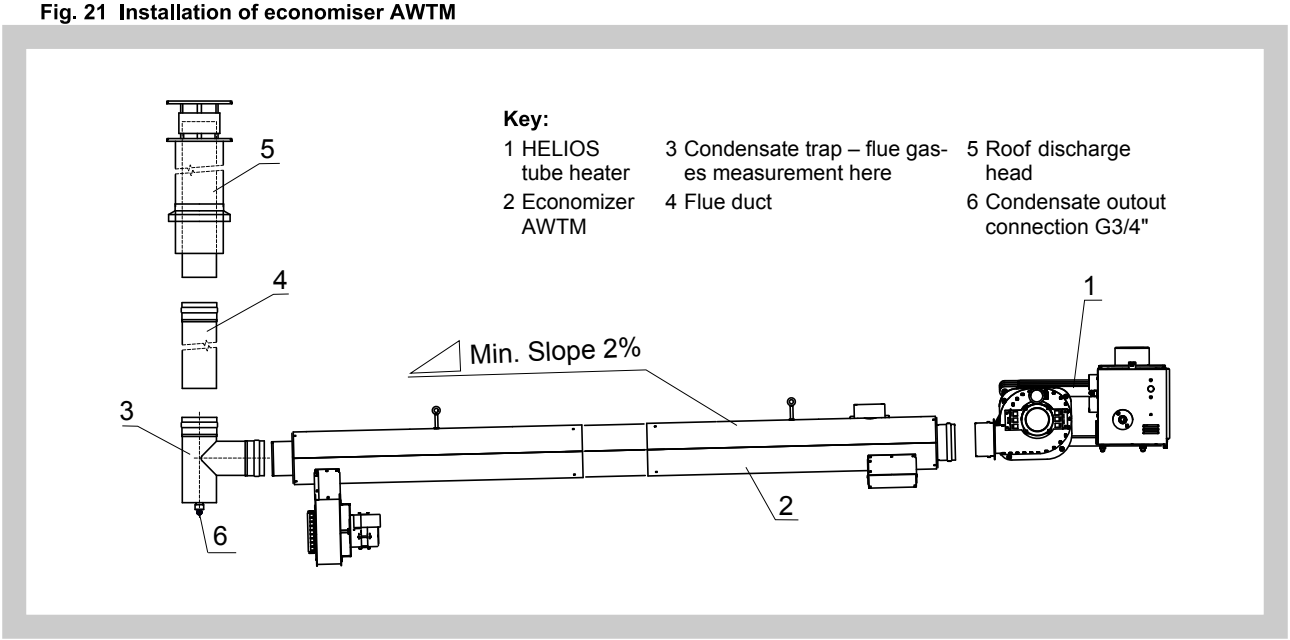
## 23. Ordering data of economizer




## 24. Installation of economizer

Economizer is placed in flue system immediately after the tube heater. The position of economizer is horizontal with slope 2% from the heater. Between heater and economizer, a bend may be inserted if necessary. For hanging, the economiser is equipped with hanging bolts which can be used for fine adjustment if its slope. Immediately after economiser, there must be condensate trap with condensate output and output of flue gases out of the building.

**Fig. 21 Installation of economiser AWTM**



## XIII. PRODUCT DATA ACCORDING TO COMMISSION REGULATION (EU) 2015/1188

Tab. 25.1 Specified technical data of infrared heaters Helios-S (burner version - one-stage)

| Model identification sign | Helios 33 SU+ | Helios 50 SU+ | Helios 70 SU+ |
|---|---|---|---|
| Type of heater | Dark tube infrared heater | | |
| Gas fuel | G20 | | |
| Emision at heating of premises $NO_x$ [Mg/kWh$_{INPUT}$ (GCV)] | 170 | 170 | 180 |
| Nominal heating power $P_{nom}$ [kW] | 36,0 | 44,6 | 67,8 |
| Minimal heating power $P_{min}$ [kW] | not applied | | |
| Radiation coefficient at nominal heating power $R_{Fnom}$ | 0,72 | 0,72 | 0,72 |
| Radiation coefficient at minimal heating power $R_{Fmin}$ | not applied | | |
| Consumption of additional el. energy during nominal heating power $el_{max}$ [kW] | 0,10 | 0,10 | 0,25 |
| Consumption of additional el. energy during minimal heating power $el_{min}$ [kW] | not applied | | |
| In standby mode $el_{SB}$ [kW] | 0 | 0 | 0 |
| Power input of permanently burning burner [kW] | not applied | | |
| Useful capacity with nominal heating power (GCV) $\eta_{th, nom}$ [%] | 81,0 | 81,0 | 81,2 |
| Useful capacity with minimal heating power (GCV) $\eta_{th, min}$ [%] | not applied | | |
| Heat emission control type | one-stage | | |
| Heating season energetic efficiency [%] | 84,1 | 84,3 | 84,2 |

Tab. 25.2 Specified technical data of infrared heaters Helios-S (burner version - one-stage)

| Model identification sign | Helios 33 SU+ e4 | Helios 50 SU+ e4 | Helios 70 SU+ e4 |
|---|---|---|---|
| Type of heater | Dark tube infrared heater with economizer AWTM 125/4000 | | |
| Gas fuel | G20 | | |
| Emision at heating of premises $NO_x$ [Mg/kWh$_{INPUT}$ (GCV)] | 170 | 170 | 180 |
| Nominal heating power $P_{nom}$ [kW] | 36,0 | 46,0 | 70,0 |
| Minimal heating power $P_{min}$ [kW] | not applied | | |
| Radiation coefficient at nominal heating power $R_{Fnom}$ | 0,72 | 0,72 | 0,72 |
| Radiation coefficient at minimal heating power $R_{Fmin}$ | not applied | | |
| Consumption of additional el. energy during nominal heating power $el_{max}$ [kW] | 0,25 | 0,25 | 0,40 |
| Consumption of additional el. energy during minimal heating power $el_{min}$ [kW] | not applied | | |
| In standby mode $el_{SB}$ [kW] | 0 | 0 | 0 |
| Power input of permanently burning burner [kW] | not applied | | |
| Useful capacity with nominal heating power (GCV) $\eta_{th, nom}$ [%] | 83,7 | 83,7 | 83,7 |
| Useful capacity with minimal heating power (GCV) $\eta_{th, min}$ [%] | not applied | | |
| Heat emission control type | one-stage | | |
| Heating season energetic efficiency [%] | 87,1 | 87,3 | 86,5 |

Tab. 25.3 Specified technical data of infrared heaters Helios-S (burner version - one-stage)

| Model identification sign | Helios 100 S+ | Helios 70 SI+ | Helios 70 SI+ e4 |
|---|---|---|---|
| Type of heater | Dark tube infrared heater | | Dark tube infrared heater with economizer |
| Gas fuel | G20 | | |
| Emision at heating of premises $NO_x$ [Mg/kWh$_{INPUT}$ (GCV)] | 170 | 180 | 180 |
| Nominal heating power $P_{nom}$ [kW] | 89,2 | 67,7 | 69,9 |
| Minimal heating power $P_{min}$ [kW] | not applied | | |
| Radiation coefficient at nominal heating power $R_{Fnom}$ | 0,70 | 0,66 | 0,66 |
| Radiation coefficient at minimal heating power $R_{Fmin}$ | not applied | | |
| Consumption of additional el. energy during nominal heating power $el_{max}$ [kW] | 0,25 | 0,25 | 0,40 |
| Consumption of additional el. energy during minimal heating power $el_{min}$ [kW] | not applied | | |
| In standby mode $el_{SB}$ [kW] | 0 | 0 | 0 |
| Power input of permanently burning burner [kW] | not applied | | |
| Useful capacity with nominal heating power (GCV) $\eta_{th, nom}$ [%] | 81,0 | 81,0 | 83,7 |
| Useful capacity with minimal heating power (GCV) $\eta_{th, min}$ [%] | not applied | | |
| Heat emission control type | one-stage | | |
| Heating season energetic efficiency [%] | 83,3 | 81,2 | 84,1 |

Tab. 25.4 Specified technical data of infrared heaters Helios-S (burner version - two-stage)

| Model identification sign | Helios 33 SUD+ | Helios 50 SUD+ | Helios 70 SUD+ |
|---|---|---|---|
| Type of heater | Dark tube infrared heater | | |
| Gas fuel | G20 | | |
| Emision at heating of premises $NO_x$ [Mg/kWh$_{INPUT}$ (GCV)] | 170 | 170 | 180 |
| Nominal heating power $P_{nom}$ [kW] | 36,0 | 44,6 | 67,8 |
| Minimal heating power $P_{min}$ [kW] | 31,70 | 38,35 | 58,30 |
| Radiation coefficient at nominal heating power $R_{Fnom}$ | 0,72 | 0,72 | 0,72 |
| Radiation coefficient at minimal heating power $R_{Fmin}$ | 0,70 | 0,70 | 0,70 |
| Consumption of additional el. energy during nominal heating power $el_{max}$ [kW] | 0,11 | 0,11 | 0,25 |
| Consumption of additional el. energy during minimal heating power $el_{min}$ [kW] | 0,11 | 0,11 | 0,25 |
| In standby mode $el_{SB}$ [kW] | 0 | 0 | 0 |
| Power input of permanently burning burner [kW] | not applied | | |
| Useful capacity with nominal heating power (GCV) $\eta_{th, nom}$ [%] | 81,0 | 81,0 | 81,2 |
| Useful capacity with minimal heating power (GCV) $\eta_{th, min}$ [%] | 79,2 | 79,2 | 79,2 |
| Heat emission control type | two-stage | | |
| Heating season energetic efficiency [%] | 82,8 | 83,0 | 82,7 |

Tab. 25.5 Specified technical data of infrared heaters Helios-S (burner version - two-stage)

| Model identification sign | Helios 33 SUD+ e4 | Helios 50 SUD+ e4 | Helios 70 SUD+ e4 |
|---|---|---|---|
| Type of heater | Dark tube infrared heater with economizer AWTM 125/4000 | | |
| Gas fuel | G20 | | |
| Emision at heating of premises $NO_x$ [Mg/kWh$_{INPUT}$ (GCV)] | 170 | 170 | 180 |
| Nominal heating power $P_{nom}$ [kW] | 36,0 | 46,0 | 70,0 |
| Minimal heating power $P_{min}$ [kW] | 31,7 | 39,9 | 60,8 |
| Radiation coefficient at nominal heating power $R_{Fnom}$ | 0,72 | 0,72 | 0,72 |
| Radiation coefficient at minimal heating power $R_{Fmin}$ | 0,70 | 0,70 | 0,70 |
| Consumption of additional el. energy during nominal heating power $el_{max}$ [kW] | 0,25 | 0,25 | 0,40 |
| Consumption of additional el. energy during minimal heating power $el_{min}$ [kW] | 0,25 | 0,25 | 0,40 |
| In standby mode $el_{SB}$ [kW] | 0 | 0 | 0 |
| Power input of permanently burning burner [kW] | not applied | | |
| Useful capacity with nominal heating power (GCV) $\eta_{th, nom}$ [%] | 83,7 | 83,7 | 83,7 |
| Useful capacity with minimal heating power (GCV) $\eta_{th, min}$ [%] | 81,9 | 82,4 | 82,7 |
| Heat emission control type | two-stage | | |
| Heating season energetic efficiency [%] | 85,8 | 85,6 | 85,8 |

Tab. 25.6 Specified technical data of infrared heaters Helios-S (burner version - two-stage)

| Model identification sign | Helios 100 SD+ | Helios 70 SID+ | Helios 70 SID+ e4 |
|---|---|---|---|
| Type of heater | Dark tube infrared heater | | Dark tube infrared heater with economizer |
| Gas fuel | G20 | | |
| Emision at heating of premises $NO_x$ [Mg/kWh$_{INPUT}$ (GCV)] | 170 | 180 | 180 |
| Nominal heating power $P_{nom}$ [kW] | 89,2 | 67,7 | 69,9 |
| Minimal heating power $P_{min}$ [kW] | 76,7 | 58,3 | 60,6 |
| Radiation coefficient at nominal heating power $R_{Fnom}$ | 0,70 | 0,66 | 0,66 |
| Radiation coefficient at minimal heating power $R_{Fmin}$ | 0,68 | 0,64 | 0,64 |
| Consumption of additional el. energy during nominal heating power $el_{max}$ [kW] | 0,25 | 0,25 | 0,40 |
| Consumption of additional el. energy during minimal heating power $el_{min}$ [kW] | 0,25 | 0,25 | 0,40 |
| In standby mode $el_{SB}$ [kW] | 0 | 0 | 0 |
| Power input of permanently burning burner [kW] | not applied | | |
| Useful capacity with nominal heating power (GCV) $\eta_{th, nom}$ [%] | 81,0 | 81,0 | 83,6 |
| Useful capacity with minimal heating power (GCV) $\eta_{th, min}$ [%] | 79,2 | 79,2 | 82,4 |
| Heat emission control type | two-stage | | |
| Heating season energetic efficiency [%] | 82,2 | 79,9 | 83,2 |

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