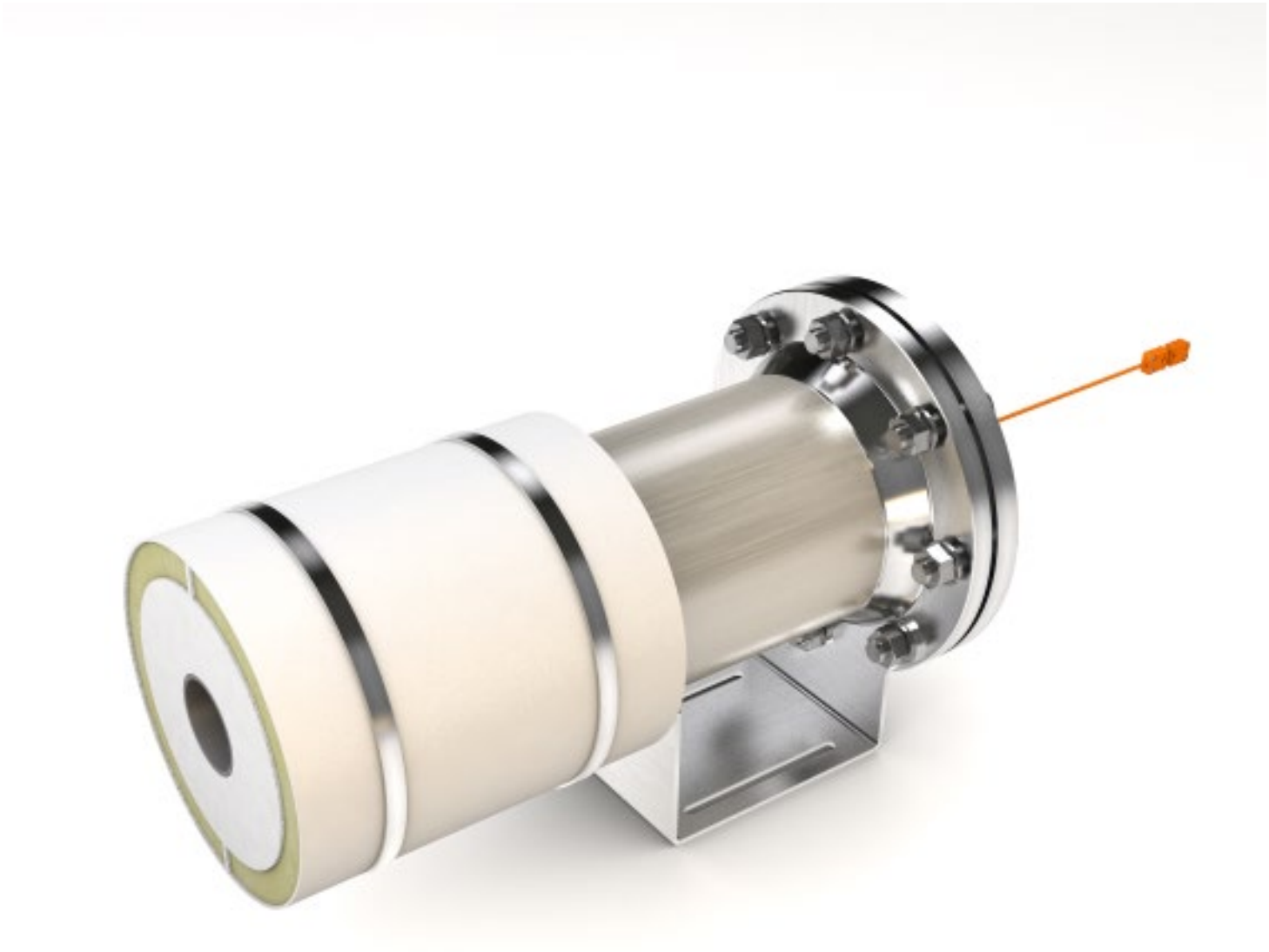
KANTHAL®

KANTHAL® FLOW HEATER
USER GUIDE



CONTENT

USER GUIDE

USER GUIDE INTRODUCTION

Please read the user guide carefully before installing, operating or maintaining the KFH and keep it for future reference. This document provides the necessary information to install, operate and maintain the KFH including safety and important information.

IMPORTANT INFORMATION

Attention alert symbols indicate potential personal injury hazards. To avoid possible injury please follow the indicated information marked by these symbols.

ATTENTION

Please read the user guide carefully before using the KFH and keep for future reference.

ATTENTION

Reference to important information.

SAFETY INFORMATION

Warning alert symbols indicate hazardous situation which could result in serious injury. Information indicated by these symbols must me followed to avoid serious injury the user.

WARNING

Danger of electrical shock.

WARNING

Danger of hot surfaces.

WARNING

Danger of fire and explosion.

WARNING

Danger of crushing.

DECLARATION OF CONFORMITY

Kanthal declares the Kanthal® Flow Heater (KFH) product group fulfills the applicable essential requirements of the EC directive: **Low Voltage Directive 2014/35/EU from 26.02.2017** with the harmonized standards: **EN ISO 60335-1:2015.**

In addition, we declare the relevant technical documentation for the KFH is compiled in accordance with: **DIN EN 82079-1: 2018.**

Authorized documentation representative:
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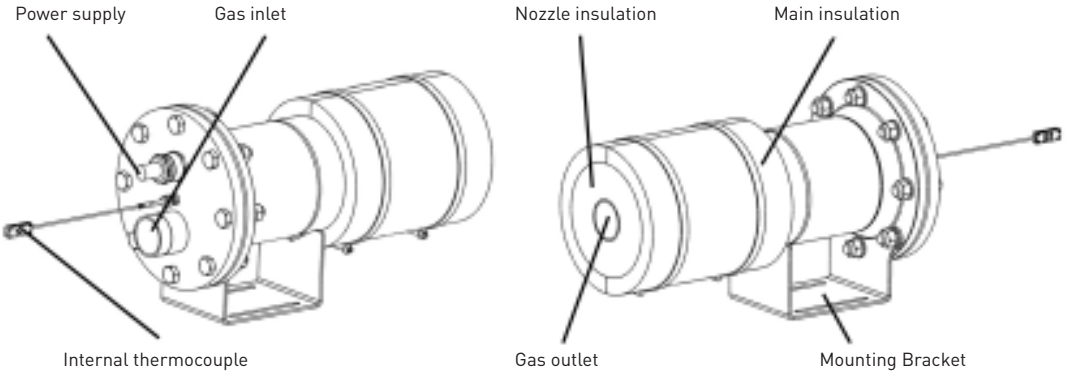
Mörfelden-Walldorf, 01.01.2019
Stefan Schatz

DESCRIPTION

The KFH is designed for heating non-dangerous gases up to 1100 °C. It is suitable for building into machines, installations and is designed for continuous as well as cycling operation.

SCOPE OF SUPPLY

The scope of supply contains the KFH including the power supply cable and the internal thermocouple, the nozzle insulation and the main insulation:



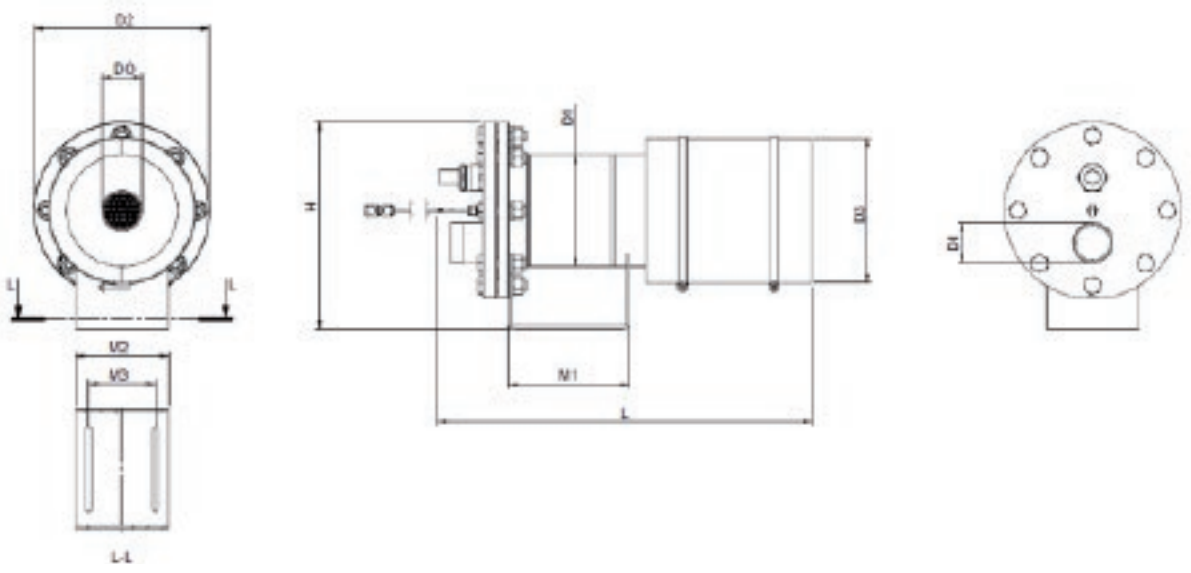
TECHNICAL SPECIFICATION

Following technical specifications are indicated for the standard KFH series and for the usage with air. By using other non-dangerous gases these specifications may change.

HEAT & FLOW DETAILS (AIR)		KFH2-03-230	KFH2-11-400	KFH2-20-400	KFH2-30-400	KFH2-40-400
Max. outlet temperature	°C	1100	1100	1100	1100	1100
Max. inlet temperature	°C	50	50	50	50	50
Max. ambient temp.	°C	40	40	40	40	40
Volume flow rate						
Nominal	m^3_S/h	8	25	45	68	90
Minimal	m^3_S/h	1.6	5	9	13,6	18
Maximal	m^3_S/h	16	50	90	136	180
Pressure drop						
Nominal	mbar	173	153	122	82	114
Minimal	mbar	62	37	27	16	21
Maximal	mbar	311	214	178	133	181
Max. operating pressure	bar_{abs}	1.5	1.5	1.5	1.5	1.5

ELECTRICAL DETAILS		KFH2-03-230	KFH2-11-400	KFH2-20-400	KFH2-30-400	KFH2-40-400
Power	kW	3,5	11	20	30	40
Current	A	16	16	29	45	59
Voltage AC	V	1x230	3x400	3x400	3x400	3x400
Resistance (± 5 %)	Ω	14.65	27.88	15.45	10.18	7.73
Frequency	Hz	50/60	50/60	50/60	50/60	50/60
Cable size	mm^2	2.5	2.5	6	16	16

MECHANICAL DETAILS			KFH2-03-230	KFH2-11-400	KFH2-20-400	KFH2-30-400	KFH2-40-400
Length	L	mm	498	519	490	595	562
Height	H	mm	170	221	264	289	310
Diameter	D1	mm	60.3	88.9	114.3	139.7	168.3
	D2	mm	140	190	210	240	265
	D3	mm	110	139	164	190	218
Inlet diameter *Ferrule pipe fitting	D1	mm	12*	26.7	42.4	48.3	60.3
Outlet diameter	D0	mm	26.7	33.7	48.3	48.3	60.3
Width	M1	mm	102	151	136	175	181
	M2	mm	70	100	140	140	140
	M3	mm	50	75	100	100	100
Weight	m	kg	8	15	19	31,5	36



The main technical specifications are additionally located on the nameplate which is placed at the main pipe of the KFH.

INSTALLATION

MECHANICAL INSTALLATION

WARNING

The KFH must not be opened as it contains live components. Disconnect the KFH from the electrical mains before modifying the installation.

ATTENTION

The KFH must be installed/ modified by qualified personal.

— Please remove any packaging material and ensure that no material is inside the KFH.
— The KFH needs to be
  – Installed horizontally.
  – Installed indoors to avoid humid conditions.
  – Installed with sufficient distance (2 m) to flammable and explosive material.
  – Oriented that the outlet is not pointed on persons or material in the environment.
— The outlet of the KFH should not be blocked.
— Protect the KFH from mechanical shocks, vibration and direct heat from other devices.
— Delivered insulation should be installed seen in description for high performance.
— Additional insulation will cause an overheating of the heating element.

GAS SUPPLY

WARNING

Disconnect the KFH from the electrical mains before modifying the installation.

ATTENTION

Always ensure the operation with a flow rate above the specified minimum. Never operate the KFH without gas supply.

— A suitable source for the gas supply dependent on the process (flow rate, pressure drop) must be used.
— The gas needs to be clean, dry and not conductive. Filters may be used to avoid a short circuit of the KFH. Carefully remove any loose material in the piping upstream of the KFH before installation.
— The flow direction must always go from gas inlet to the gas outlet connection.
— All connections must be gastight.
— A diameter reduction at the inlet may cause a "jet stream" and damage the heating element.
— A safety device detecting a gas supply failure is recommended.

ELECTRICAL INSTALLATION

WARNING

Damaged power supply cable must be replaced by qualified personal. Disconnect the KFH from the electrical mains before modifying the installation.

ATTENTION

The KFH must be connected by qualified personal. The protective ground wire conductor must be connected.

- The KFH is equipped with a power supply cable (2.5 m) internally connected to the heating element. The external connection to the electrical mains should be in accordance with the wiring diagram.
- It must be ensured that the power supply cable
  - Has the corresponding cross section area of the conductor.
  - Is protected against mechanical strain.
  - Comes not in contact with the hot KFH pipe or is exposed to hot gases.
  - Does not exceed the temperature limitation (180 °C).
- The internal thermocouple, measuring the temperature of the heating element, should be connected to the control of the KFH. The temperature limitation is marked on the internal thermocouple.
- For human safety it is recommended to use an RCD.
- To ensure cable protection a fuse must be installed.
  - For a three phase KFH, it is recommended to use a three-phase fuse. Single fuses can cause phase asymmetry in case of tripping. This can destroy the heating element.
- SCR power switches are recommended, preferable thyristor switches may be used. In case of 3 phases, phase asymmetry protection is recommended.

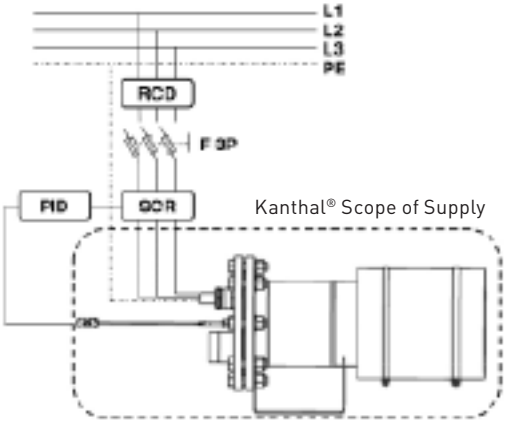


Figure 3: Circuit diagram of 3-phase KFH

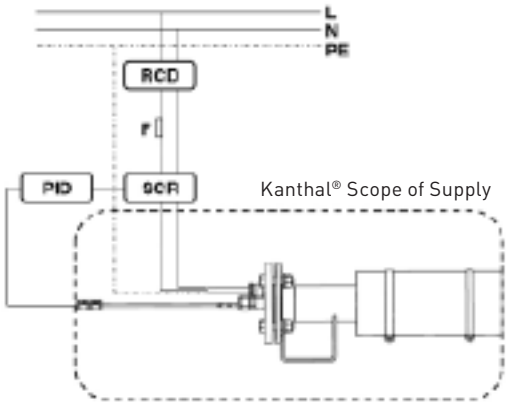


Figure 4: Circuit diagram of 1-phase KFH

L	Line	RCD	Residual-Current Device
N	Neutral	F 3P	Fuse Switch 3-phase
PE	Protective Earth	PID	Proportional-Integral-Derivative controller
F	Fuse	SCR	Silicon Controlled Rectifier

OPERATION

ATTENTION

Always operate the KFH
— Within the indicated range of the technical specifications.
— Should not be left unattended.

ATTENTION

Always ensure the operation with a flow rate above the specified minimum. Switch off the power supply when a safety device is triggered.

PROPER OPERATION

The KFH must be operated within the indicated range of the technical specifications (user guide, nameplate).

IMPROPER OPERATION

Never operate the KFH
— Outside of the indicated range of the technical specifications.
— Without gas supply.
— Without usage of the internal thermocouple as overheat protection.
— With higher temperature as marked on the internal thermocouple.

OPERATION PROCEDURE

— Before the first use of the KFH following steps should be followed:
  – Check the electrical resistance (Between line and line).
  – Check the electrical insulation resistance (1000 V between protective ground and line).
  – Visual inspection of the KFH and the thermal insulation
— Start: Switch on the gas supply before switching on the power supply.
— Stopp: Switch off the power supply and allow the KFH a sufficient cooling time before switching off the gas supply (10 min).
— Recommended temperature ramp rate (up and down) is max. 30 K/min.
— Alterations in the gas supply should not occur rapidly (max. (1 $mS^3/h)/s$).
— High temperatures may appear on the insulation surface or casing.
— In the event of a gas supply failure, the power supply must be disconnected immediately.
— In the event of a power supply failure, allow the KFH a sufficient cooling time before switching off the gas supply (10 min).
— Inspection after an event of failure:
  – Check the electrical resistance (Between line and line).
  – Check the electrical insulation resistance (1000 V between protective ground and line).
  – Check the thermal insulation properties.

MAINTENANCE

ATTENTION

Maintenance work must be carried out by qualified personal. Disconnect the KFH from the electrical mains before modifying the installation.

Heating of Nitrogen may require regular (1 to 6 months depending on the process) re-oxidation of the heating element.

Re-oxidize procedure
- Install appropriate air supply.
- Flow rate should be set below the process flow rate.
- The internal thermocouple must be set to 1000°C.
- Operate the KFH for min. 12 h.
- Avoid unstable output of the controller for best results.

TRANSPORT

ATTENTION

Protect the KFH from mechanical shocks during transportation.

Transportation points must not be the power supply cable or the internal thermocouple.

DISPOSAL

ATTENTION

Electrical equipment, accessories and packaging material should be recycled in an environmental way. For EU countries: Do not dispose electrical equipment with household refuse.

ACCESSORIES

Only Kanthal® accessories may be used.

Kanthal® offers following accessories:
- Control cabinets.
- Blowers (adjustable by frequency control).
- High temperature outlet connections and piping.
- High-performance insulation (customized).

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06.2022