KANTHAL®

THE KANTHAL® FLOW HEATER

RAISE THE TEMPERATURE. NOT THE RISK.



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INTRODUCTION

The latest third-generation Kanthal® Flow Heater offers reliable, precise, and efficient heating for your process. It heats process gas directly as it flows through the core, reaching outlet temperatures up to 1,100°C (2,012°F) and surpassing conventional electric or gas-fired heaters. The patented design ensures ±1°C accuracy across different flow rates, maintaining uniformity when consistent conditions are essential for product quality. Electrically heated, it generates no NO_x, SO_x or CO_2 emissions, requires no burner maintenance, and eliminates the need to monitor a flame—delivering a cleaner process from start to finish.

Why Choose the Kanthal® Flow Heater? Here's what changes when you switch.

PRODUCTIVITY	TECHNOLOGY	MAINTENANCE
• High-temperature performance: Outlet temperatures up to 1,100°C (2,012°F), well beyond traditional electric or gas-fired alternatives, opening processes previously out of reach. • Lower energy costs —>95% thermal efficiency, with heat recovery, turns more input into usable heat and lower spend. • Flexible process integration: High turndown ratio 10:1 and flow capacity enable it to adjust to varying production needs.	• Consistent product quality: ±1°C accuracy holds your process steady. Less wastage, more consistency. • High power, compact footprint: Power density on par with gas burners, in a fraction of the space. • Modular and plug-and-play system: wide range of product offerings, including scalability	• Reliable, safe operation: Integrated monitoring and over-temperature protection guard your uptime and equipment. • Built for dynamic conditions: Engineered for pulsating flows. Steady performance. • A complete system: Control cabinets, blowers, and accessories. • Refurbishable: designed for long-term use and can be fully refurbished.

YOU NEED	WITH KANTHAL® FLOW HEATER, YOU GET
Higher process temperatures	Up to 1,100°C (2,012°F) outlet temperatures
Reduce energy costs	>95% thermal efficiency
Tighter quality control	±1°C temperature accuracy
Increase throughput	Fast response, high power density
Reduce downtime	Built-in protection
Simple installation	Compact, complete system
Future-proof operations	Zero combustion emissions
Lower lifetime cost	Refurbishable, low maintenance

GENERAL SPECIFICATION TABLE

PARAMETER	UNIT	KFH3-10-400	KFH3-20-400	KFH3-40-400
Rated electrical power	kW	10	20	40
Mains voltage	V	3 x 400 ± 4%		
Mains frequency	Hz	50... 60		
Power Factor	-	1 (purely Ohmian consumer)		
Electrical connection	-	3L + PE		
Wiring type	-	Star (internal)		
Electrical protection class	-	I		
External resistance Rij ±5%	Ohm	30.56	15.28	7.64
Temperature sensor	-	4x TC Type N		
Max. outlet temperature (air)	°C	1,100		
Permissible operating pressure	kPa (g)	50 (0,5 bar(g))		
Permissible ambient temperature	°C	0... 40		
IP protection class	-	IP 54 (after installation in process)		

WHEREVER YOUR APPLICATION TAKES YOU

Greater efficiency, less downtime, and tighter control across every process the Kanthal® Flow Heater touches.

ESTABLISHED INDUSTRIAL PROCESSES

Aluminum — Ceramic foam filter box preheating: Preheating filter boxes ahead of molten metal filtration prevents thermal shock and stabilizes the process.



How the Flow Heater adds value

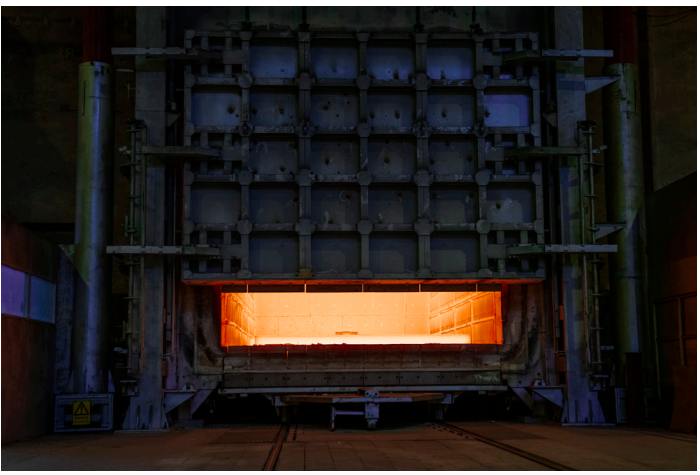
- Uniform preheating – Minimized temperature gradients
- Precise temperature control - Protects filters and refractory components
- Clean, combustion-free heating - Avoids flame and exhaust-gas contamination; dry heat
- Faster preheating cycles – Energy savings and shorter changeover time

Automotive — Regenerative thermal oxidizers (RTOs): RTOs destroy VOCs generated during manufacturing. Precise high-temperature air heating raises oxidation efficiency while keeping energy use in check.



How the Flow Heater adds value

- Stable outlet temperatures up to 1,100°C - High temperatures support consistent VOC destruction
- Rapid power modulation - Responds quickly to changing process loads
- Easy retrofit of gas burners – Minimum furnace modification
- Green - Helps to reduce greenhouse gas emissions, NO_x, and SO_x
- Precise - Ensures excellent outlet temperature accuracy within ±1°C



Industrial Furnaces - Alternative to Gas Burners: A direct swap for gas burners — same high-temperature operation, none of the combustion emissions, tighter process control.

How the Flow Heater adds value

- Zero Combustion Emissions - No on-site CO_2 or NO_x generation
- Precise Heat Control - Improves temperature stability and repeat-ability
- High Energy Efficiency - Avoids burner and flue-gas losses
- Simplified Infrastructure - No fuel train, flame supervision or exhaust handling



Specialty Chemical & Petrochemical — Steam Superheating: Super-heated steam supports processes such as reforming, cracking, stripping, reactor heating, and high-temperature testing. Direct electric heating delivers dry steam at a precisely controlled temperature without combus-tion.

How the Flow Heater adds value

- Direct Heating Technology – Significant impact on overall system efficiency
- Precise Steam Temperature - Maintains stable process and reactor inlet conditions
- Fast Thermal Response - Adjusts rapidly to changing steam flow and temperature demand
- Compact Footprint - Simplifies integration into new and existing process systems
- Low Pressure Drop - Minimizes impact on available steam pressure
- High Availability - Supports reliable operation in continuous process-es



Petrochemical — Power-to-Liquid: Power-to-liquid converts renewable electricity into sustainable fuels and chemicals. High-temperature gas heating drives the reaction — fossil-free, from source to synthesis.

How the Flow Heater adds value

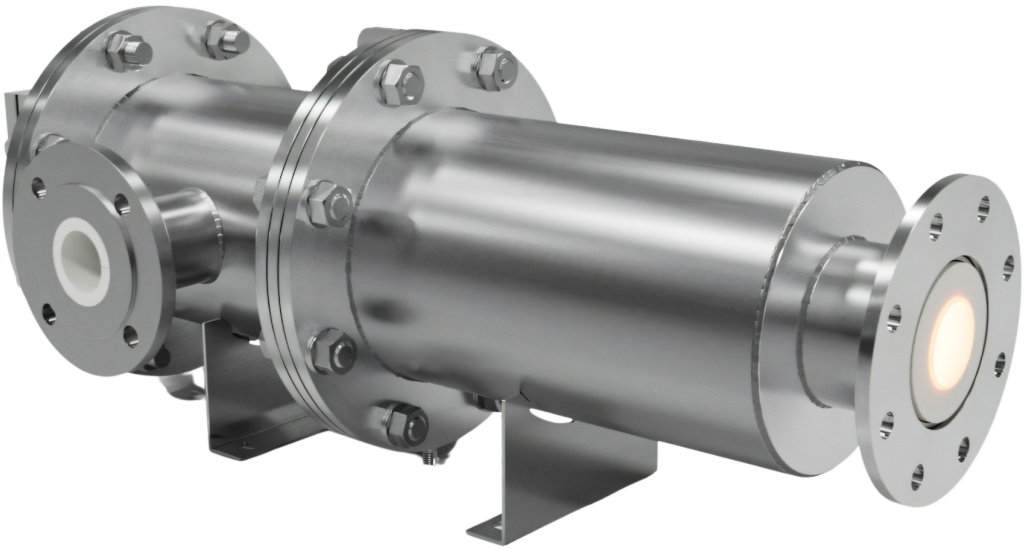
- Precise Reaction Control - Maintains stable reactor inlet conditions
- Flexible Load Operation - Responds rapidly to changing process de-mand
- Compact Footprint - Simplifies integration into space-constrained plants and pilot units
- Low Pressure Drop - Minimizes impact on upstream compression requirements
- High Availability - Supports reliable operation and continuous produc-tion

ADVANCED MATERIALS & EMERGING TECHNOLOGY

- Energy - Solid Oxide Fuel Cells (SOFCs): With precise gas and air heating, efficiency, performance, and durability follow.
- Battery Materials - Li-ion Cathode Powder Calcination: Precise temperature control keeps material properties consistent, batch after batch.
- Electronics - Steam Superheating for MLCC De-binding: Accurate temperature control keeps the process stable and the product consistent.
- Research & Development - Pilot Plants & Test Benches: Pilot-scale work demands flexibility across a wide range of conditions. Precise control and fast response make it ideal for validation.
- Heat Treatment - Localized Heat Treatment: Treat only what needs treating. Localized, high-temperature air heating sharpens process control and minimizes thermal distortion elsewhere on the part.

How the Flow Heater adds value

- High thermal efficiency
- Precise process and temperature conditions
- High system availability and performance
- Zero combustion emissions and safe operations
- Fast response to process fluctuations
- Simplified plug-and-play type installation
- Compact footprint
- Low pressure drop
- Wide range of operating conditions



SELECT YOUR KANTHAL® FLOW HEATER

Every project starts with the right size. Follow the steps below to specify your heater, then check what ships as standard.

1 Define process
Gas, temperatures, flow

→

2 Calculate power
See power requirement

→

3 Add margin
10-20% safety

↓

4 Match a model
See model comparison

5 Above 40kW?
Custom or parallel usage of multiple Flow Heaters

Power requirement

Heating power demand

$$P = \dot{m} \cdot c_p \cdot \Delta T \cdot = \rho_g \cdot \dot{V}_s \cdot c_p \cdot (T_{out} - T_{in})$$

PARAMETER	SYMBOL	UNIT
Power	P	kW
Mass flow rate	$\dot{m}$	kg/s
Standard* gas density	ρ_g	kg/m^3
Standard* volume flow rate	$\dot{V}_s$	m^3/h
Specific heat capacity	c_p	kJ/(kg K)
Temperature difference	ΔT	K
Outlet temperature	T_{out}	K
Inlet temperature	T_{in}	K

*Standard condition at 1.013 bar abs, 0°C (32°F)

PRODUCT OVERVIEW

Model comparison

MODEL	POWER RANGE	MIN FLOW	NOMINAL FLOW	MAX FLOW	GAS TYPES
KFH3-10-400	10 kW	1.4 kg/h	28 kg/h	56 kg/h	Air, N_2, H_2, H_2O (steam), CO_2
KFH3-20-400	20 kW	2.8 kg/h	56 kg/h	112 kg/h	Air, N_2, H_2, H_2O (steam), CO_2
KFH3-40-400	40 kW	5.6 kg/h	112 kg/h	224 kg/h	Air, N_2, H_2, H_2O (steam), CO_2

For other gas mixtures, please consult the Kanthal team.

Scope of supply

Every Kanthal® Flow Heater ships ready to install.

Thermocouple
Advanced temperature sensing technology

Insulation
High performance, built in

Metal casing
Stainless steel body

Electrical connection
Standard power feedthroughs

Outlet connection
Standard flange connection, internally insulated

Spares & refurbishment
Quick service, lower ownership cost

Standard gas types for model selection: Air, N_2, H_2, H_2O (steam), CO_2
For other gas mixtures, please consult the Kanthal team.

SCOPE OF SUPPLY

Kanthal® Flow Heater – inline electric air and process gas heater

- Heating core: Patented direct heating technology
- Insulation: High-performance, built-in
- Thermocouples: Process and protection temperature sensors
- Casing: Metal shell including inlet & outlet connections and mounting brackets
- Terminal enclosure: including power feedthroughs, cable glands, and sensor miniature connector
- Standard thyristor control cabinets: as accessories
- Standard blower: as accessories

Power requirement calculation

$$P_{required} = \frac{\dot{m} \times c_{p,avg} \times (T_{out} - T_{in})}{3600} \times (1 + \text{power margin})$$

Assumptions:

- Process gas: Air
- Nominal mass flow: 45 kg/hr
- Inlet temperature: 50 °C
- Outlet temperature: 1,000 °C
- Temperature rise: 950 °C
- Average specific heat capacity of air: 1.08 kJ/(kg. °C)
- Power safety margin: 10%

$P_{required}$ = 14.1 kW

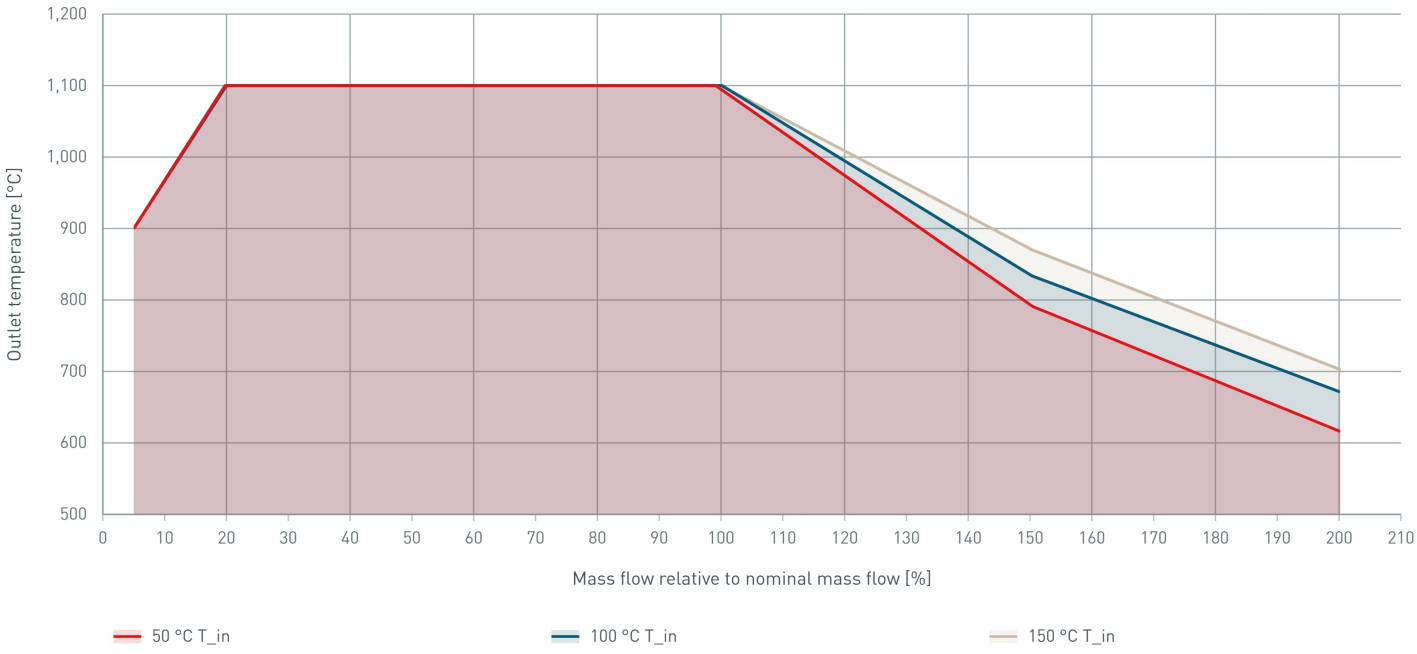
Conclusion: The power requirement analysis indicates that a 20 kW Flow Heater is adequately sized to meet the application's operating demands.

A power safety margin of 10-20% over the theoretically required power is recommended. Piping and thermal insulation downstream of the Kanthal Flow Heater may cause higher heat losses that must be accounted for in the power requirement. Applications with power higher than 40 kW require customized or parallel usage of standard Flow Heaters. The recommended solution is the parallel use of multiple Flow Heaters to optimize lifetime and spare-parts availability.

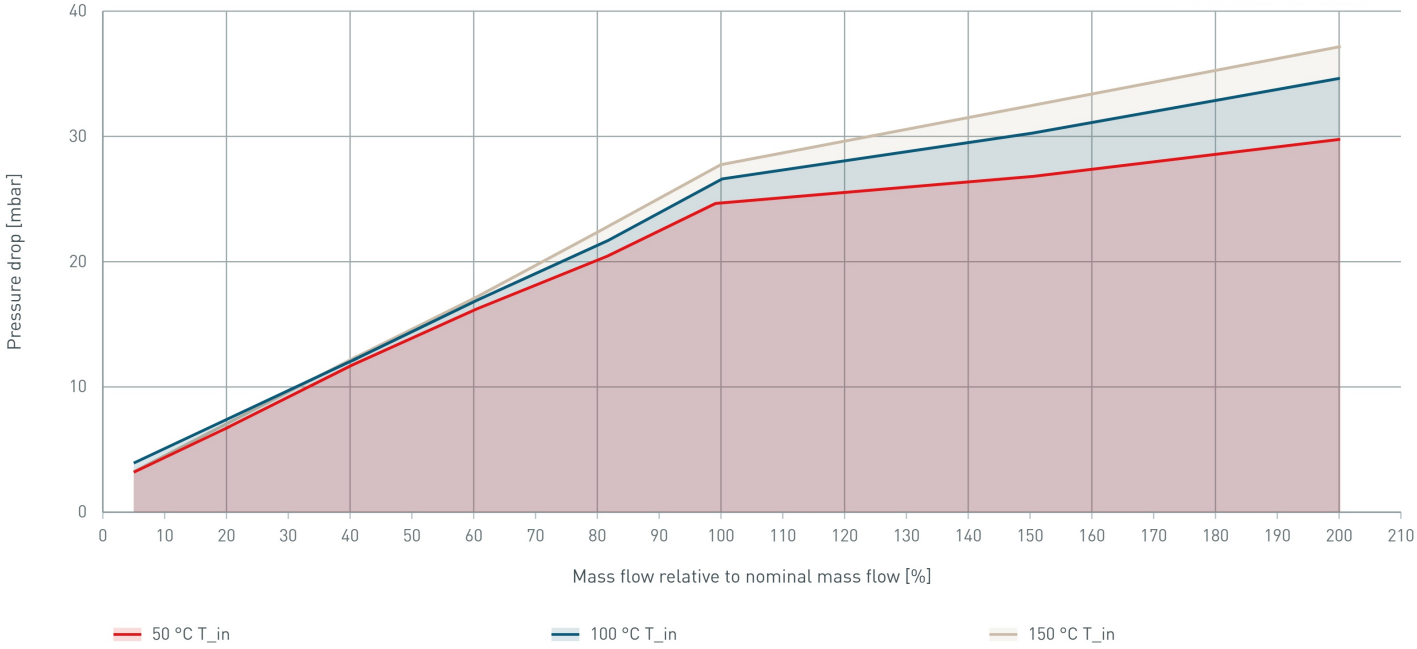
PERFORMANCE GRAPHS

FLOW HEATER 10KW

OUTLET TEMPERATURE IN CLEAN AIR

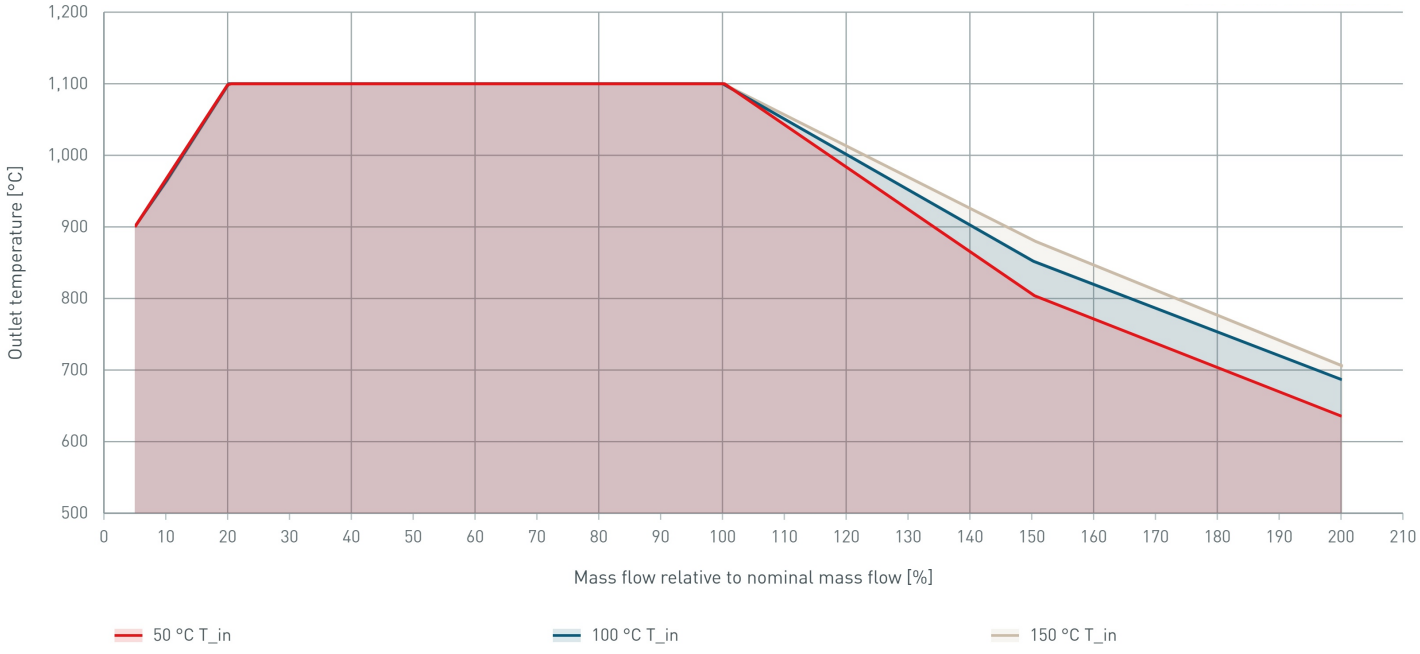


PRESSURE DROP IN CLEAN AIR

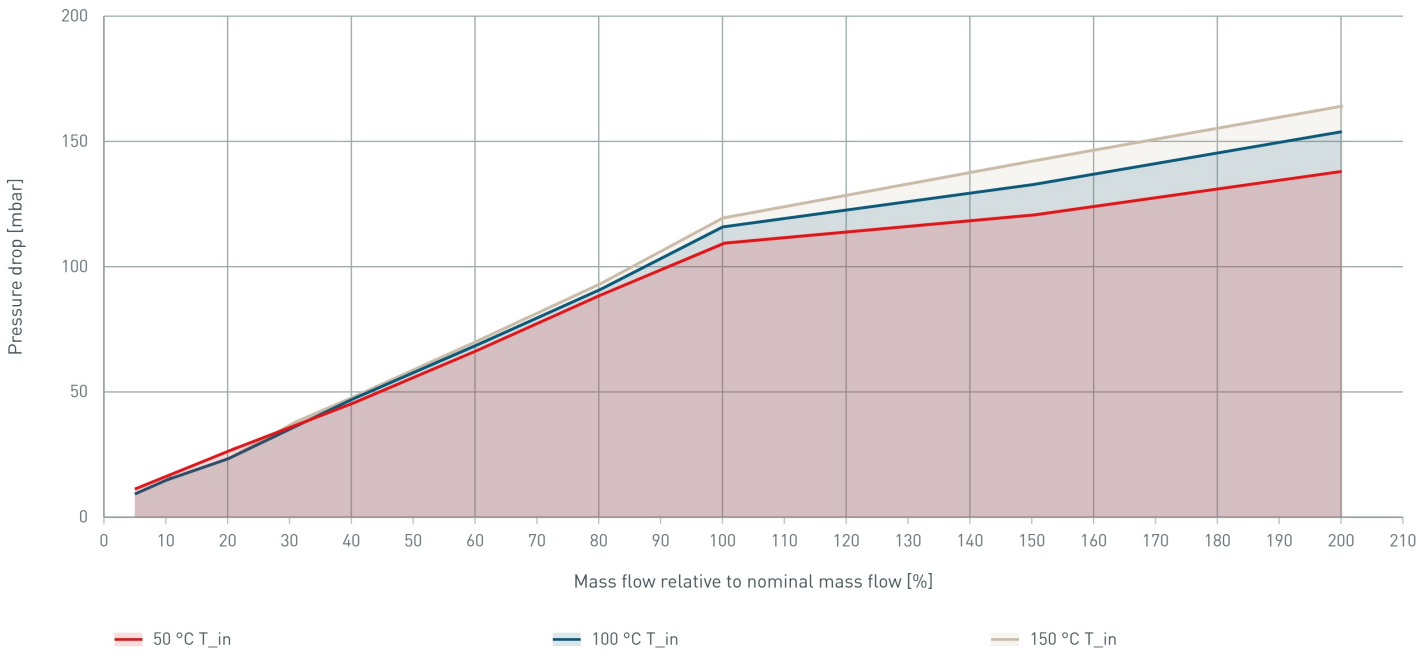


FLOW HEATER 20KW

OUTLET TEMPERATURE IN CLEAN AIR

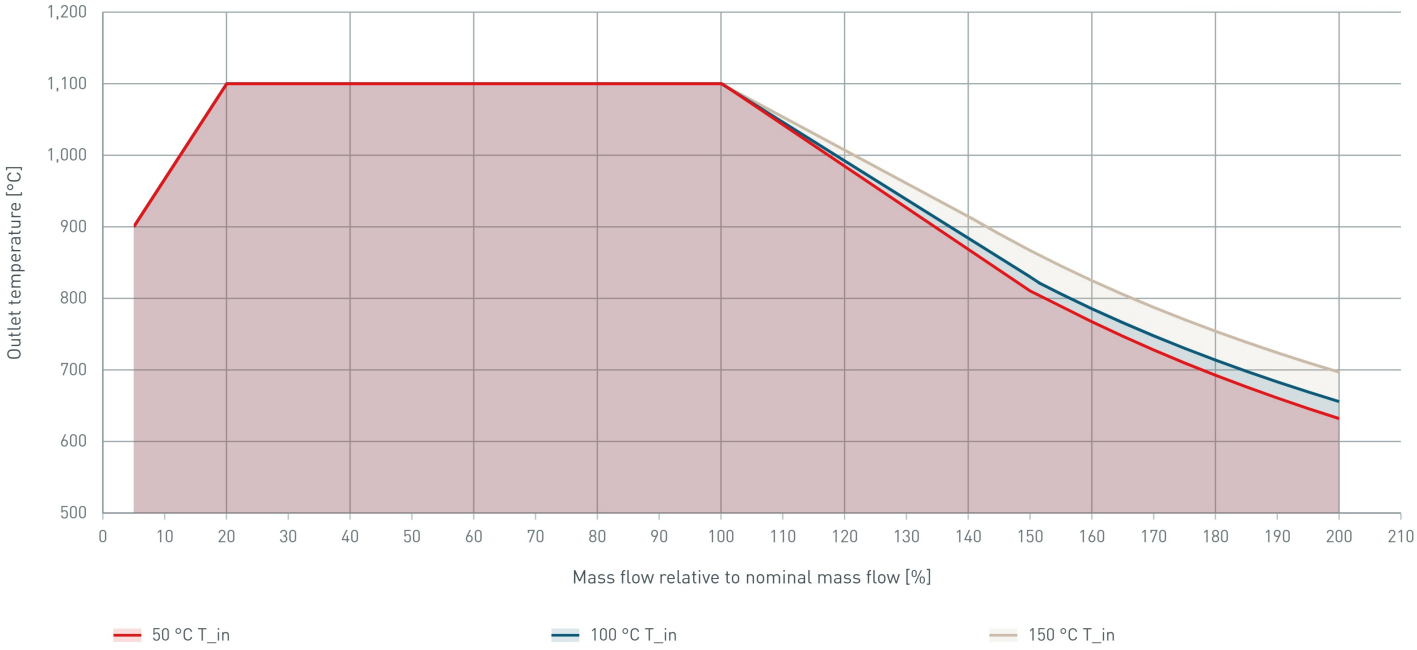


PRESSURE DROP IN CLEAN AIR

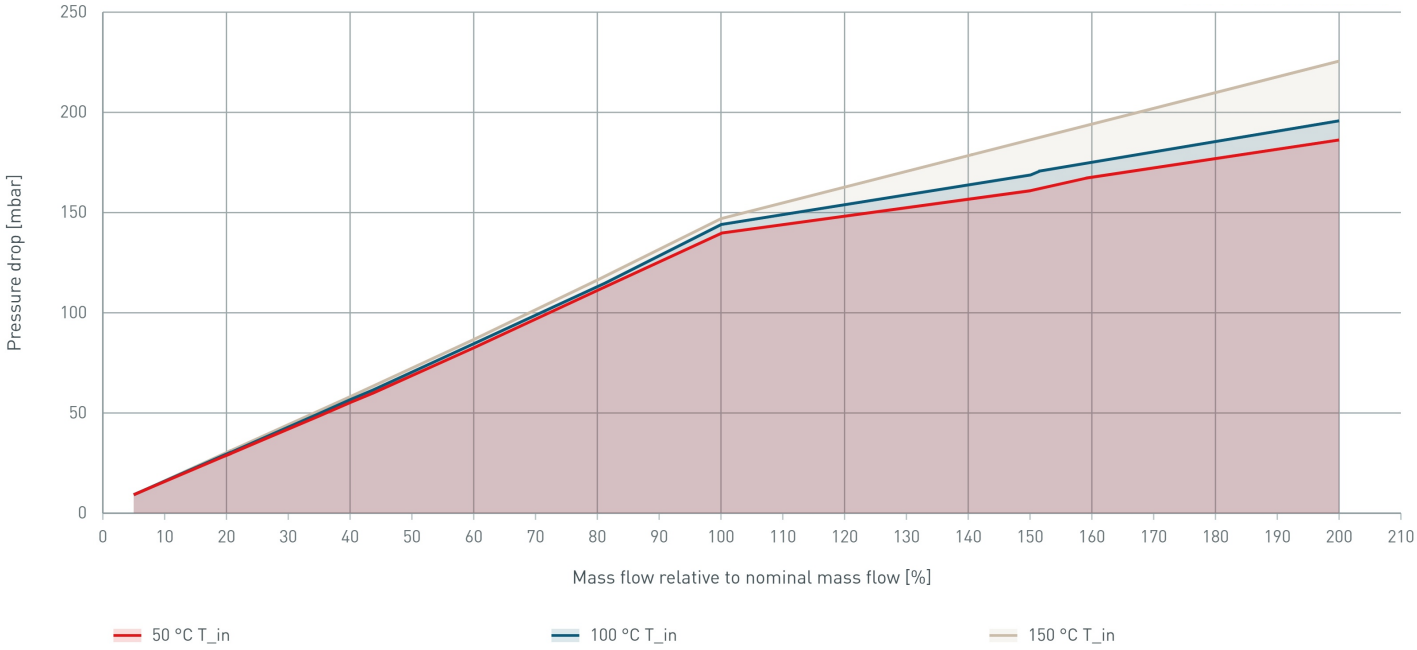


FLOW HEATER 40KW

OUTLET TEMPERATURE IN CLEAN AIR



PRESSURE DROP IN CLEAN AIR



TECHNICAL DATA

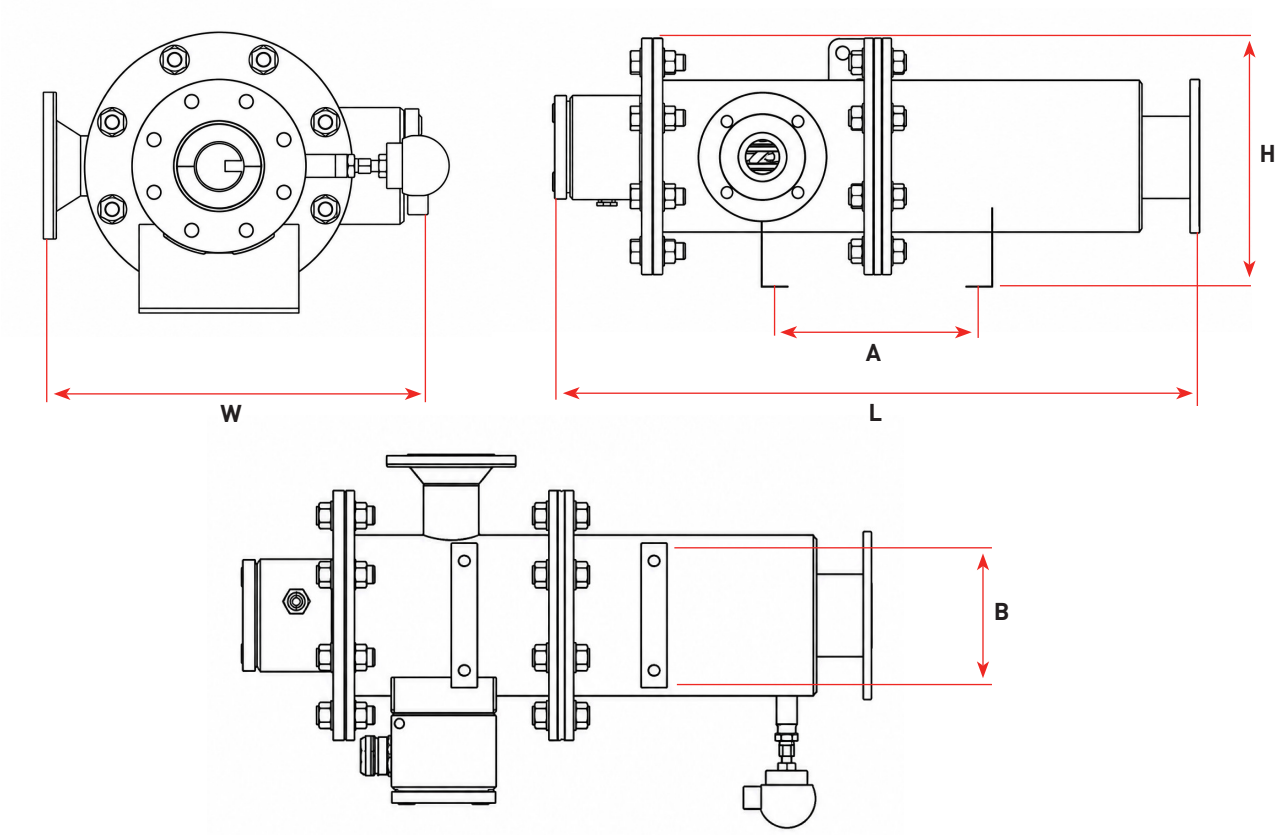
HEAT AND FLOW DETAILS

PROCESS GAS			AIR		
PARAMETER	**SYMBOL**	**UNIT**	**KFH3-10-400**	**KFH3-20-400**	**KFH3-40-400**
Permissible gas temperature at the inlet	T_{GI}	°C	-20... 150		
Max. permissible gas temperature at the outlet	$T_{GO,max}$	°C	1100		
Max. permissible temperature on the heating bundle	$T_{HB,max}$	°C	1000		
Minimum mass flow	MF_{min}	kg/h	1,4	2,8	5,6
Nominal mass flow	MF_{nom}	kg/h	28	56	112
Maximum mass flow	MF_{max}	kg/h	56	112	224

PROCESS GAS			NITROGEN (N_2)		
PARAMETER	**SYMBOL**	**UNIT**	**KFH3-10-400**	**KFH3-20-400**	**KFH3-40-400**
Permissible gas temperature at the inlet	T_{GI}	°C	-20... 150		
Max. permissible gas temperature at the outlet	$T_{GO,max}$	°C	850		
Max. permissible temperature on the heating bundle	$T_{HB,max}$	°C	800		
Minimum mass flow	MF_{min}	kg/h	1,45	2,9	5,8
Nominal mass flow	MF_{nom}	kg/h	35	70	140
Maximum mass flow	MF_{max}	kg/h	70	140	280

PROCESS GAS			STEAM (H_2O)		
PARAMETER	**SYMBOL**	**UNIT**	**KFH3-10-400**	**KFH3-20-400**	**KFH3-40-400**
Permissible gas temperature at the inlet	T_{GI}	°C	120... 150		
Max. permissible gas temperature at the outlet	$T_{GO,max}$	°C	⩽1100		
Max. permissible temperature on the heating bundle	$T_{HB,max}$	°C	⩽1000		
Minimum mass flow	MF_{min}	kg/h	0,75	1,5	3
Nominal mass flow	MF_{nom}	kg/h	15	30	60
Maximum mass flow	MF_{max}	kg/h	30	60	120

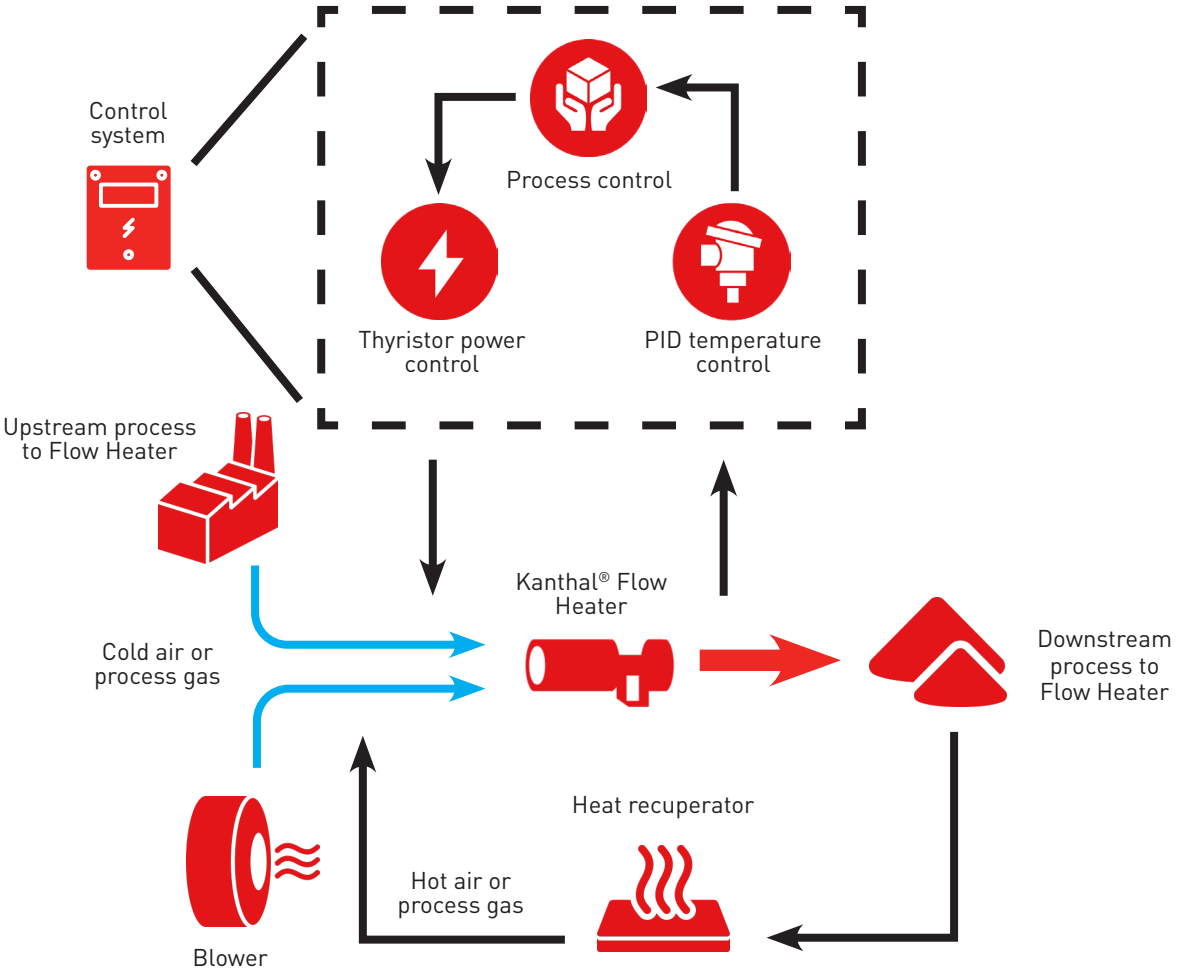
MECHANICAL DETAILS KFH



PARAMETER	SYMBOL	UNIT	KFH3-10-400	KFH3-20-400	KFH3-40-400
Casing material	-	-	Stainless steel 1.4301 (AISI 304)		
Total length	L	mm	922		
Total width	W	mm	512		
Total height	H	mm	360		
Axial hole spacing	A	mm	286		
Radial hole spacing	B	mm	150		
Total weight	m	kg	78	78	82
Inlet connection	-	-	Flange DN65 PN 16 (EN 1092-1)		
Outlet connection	-	-	Flange DN100 PN 10 (EN 1092-1), reduced thickness		

ACCESSORIES

HOW THE KANTHAL® FLOW HEATER FITS INTO YOUR PROCESS



Aluminum Processing

CFF Filterbox preheating, launder and ladle preheating

Petrochemical Processes

Process gas heating for H2-production via SOEC, SAF & e-Fuel production

Automotive

VOC treatment in RTOs, Li-Ion battery material processing

Industrial Heat Treatment

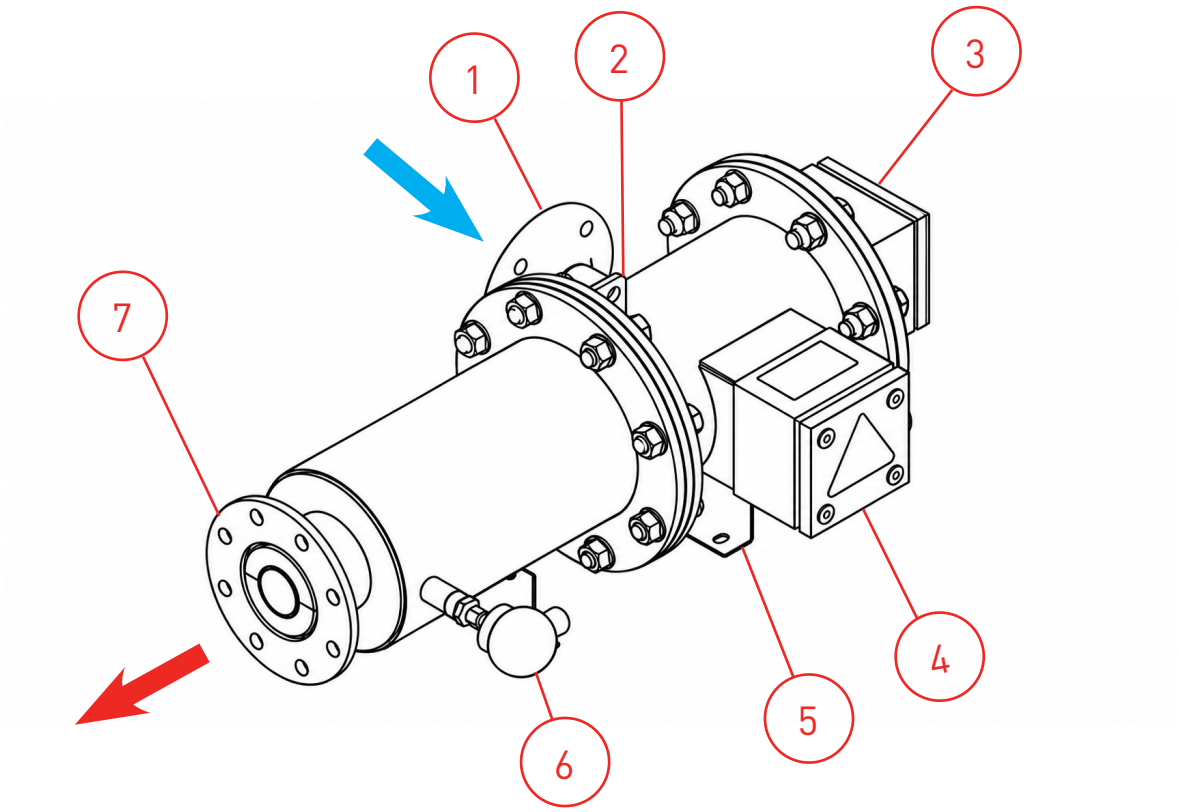
1:1 replacement of gas burners; localized heat treatment

Pilot Plants and R&D

Test bench set ups and process validations

WHY KANTHAL?

UP TO 1,100°C High outlet temperature	**>95% Energy efficiency**	**±1°C Temperature accuracy**	**SAFE & RELIABLE Operation with advanced controls**	**COMPACT & EASY TO INTEGRATE Small footprint**	**EASY TO INSTALL & MAINTAIN Minimal downtime**



SL. NO.	DESCRIPTION	FUNCTION
1	Gas inlet	Cold process gas supply
2	Lifting lug	Anchorage point
3	Junction box temperature sensors	Take over point for internal temperature sensors
4	Terminal box power supply	Take over point for power feedthroughs
5	Heater stand	Attachment for horizontal and vertical operation
6	Outlet process gas temperature sensor (N-type)	Measuring point of gas outlet temperature
7	Gas outlet nozzle	Exit of hot process gas

CONTROL SYSTEM

Kanthal® Control Cabinets are designed and optimized for operation of the standard Flow Heater series and assure maximum heater performance and optimal lifetime. Standard Control Cabinets are made for easy to use operation. Besides from that custom solutions can be offered like PLC compatibility and standard automation protocols.

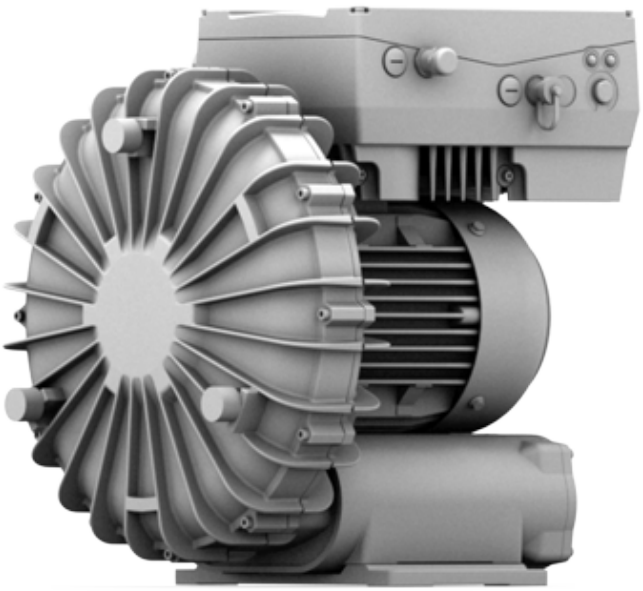
PRODUCT CODE	COMPATIBLE TO	DIMENSIONS			WEIGHT	ELECTRICAL SUPPLY		
		L mm	W mm	H mm	m kg	U V		I A
CC-KFH3-10-400-CE	KFH3-10-400-CE	600	350	600	45	400	3L + N	16
CC-KFH3-20-400-CE	KFH3-20-400-CE	600	350	600	45	400	3L + N	29
CC-KFH3-40-400-CE	KFH3-40-400-CE	600	350	600	50	400	3L + N	58



BLOWER

Kanthal® Blowers are equipped with flow rate control (variable frequency drive) and with air filter to ensure safe and long-life operation of the Flow Heater.

PRODUCT CODE	COMPATIBLE TO	DIMENSIONS			WEIGHT	ELECTRICAL SUPPLY		
		L mm	W mm	H mm	m kg	U V		I A
SCB-KFH3-10-400	KFH3-10-400	424	264	380	32	400	3L	16
SCB-KFH3-20-400	KFH3-20-400	424	264	380	32	400	3L	16
SCB-KFH3-40-400	KFH3-40-400	428	306	407	34	400	3L	16



REFURBISHMENT & LIFECYCLE SUPPORT

The Kanthal® Flow Heater Gen3 is designed for long-term use and can be fully refurbished, with key parts restored for continued operation after extended use. When paired with an annual maintenance schedule, this strategy ensures high equipment availability, minimizes unplanned downtime, and maintains reliable performance throughout its lifecycle. This method helps cut operating costs, reduce waste, and lower total cost of ownership compared to traditional non-refurbishable designs.

On-site scope — Periodic annual maintenance

- Replace the temperature sensor at periodic intervals as recommended by Kanthal to maintain optimal process performance and ensure safety.

- Sensors are essential for precise control, heater protection, and overall system reliability.

- Qualified site personnel should perform replacements following the procedures in the Installation, Operation & Maintenance (IOM) manual.

Kanthal factory scope — Major refurbishment

Every 24 months, the Flow Heater should be returned to Kanthal, where refurbishment is carried out to factory specification and quality procedure. This scope includes replacement of:

- Heater core and connection plates
- Internal insulation
- Temperature sensors

Following refurbishment, the heater is restored to specified performance standards, extending service life and reducing lifecycle costs.

The table below provides article numbers for operational spares and major refurbishment services.

PRODUCT DESCRIPTION	ARTICLE NUMBER	SCOPE DESCRIPTION
Kanthal® Flow Heater 10kW Gen3 - overall refurbishment	DFH500482	• Full heater refurbishment, consisting of: • - Heating bundle • - Internal insulation • -Thermocouple set (4 nos.) • - Union nuts and clamping rings
Kanthal® Flow Heater 20kW Gen3 - overall refurbishment	DFH500483	
Kanthal® Flow Heater 40kW Gen3 - overall refurbishment	DFH500484	
Kanthal® Flow Heater 10kW Gen3 - Thermocouple replacement set	DFH500477	• Set exchange of N-type sensors, consisting of: • - Thermocouple TG, Gas Inlet Temperature • - Thermocouple THB, Heating Bundle Temperature • - Thermocouple THM Heating Bundle Temperature Axial Centre • - Thermocouple TGO Gas Outlet Temperature • - Union nuts and clamping rings
Kanthal® Flow Heater 20kW Gen3 - Thermocouple replacement set	DFH500478	
Kanthal® Flow Heater 40kW Gen3 - Thermocouple replacement set	DFH500479	

CUSTOM SOLUTIONS

Kanthal offers customized Flow Heater solutions for applications beyond the standard range, including specific gas compositions, operating pressures, and inlet temperatures. The modular heater core can be tailored and scaled up to MW capacities. Contact your local Kanthal representative to discuss your application requirements.

Kanthal Flow Heaters can be custom engineered to meet a wide range of process requirements across industries such as petrochemicals (SOEC, RWGS, Power-to-Liquid), regenerative thermal oxidizers (RTOs), steam superheating for MLCC manufacturing, industrial burner replacement, SOFC systems, hydrogen heating for ironmaking, and thermal energy storage applications.

Kanthal® offers Flow Heater solutions with unit capacities up to 1 MW, designed for high operating pressures and certified to ASME or PED standards. The heaters can accommodate inlet gas temperatures up to 700°C and are available for use with hazardous gases and in ATEX/IECEx-certified areas.

Designed for long service life, the heaters feature refurbishable and easy-to-maintain heating units, combining a compact footprint, robust construction, and high energy efficiency for demanding industrial environments.

FOR CONTACT INFORMATION PLEASE VISIT KANTHAL.COM

KANTHAL®