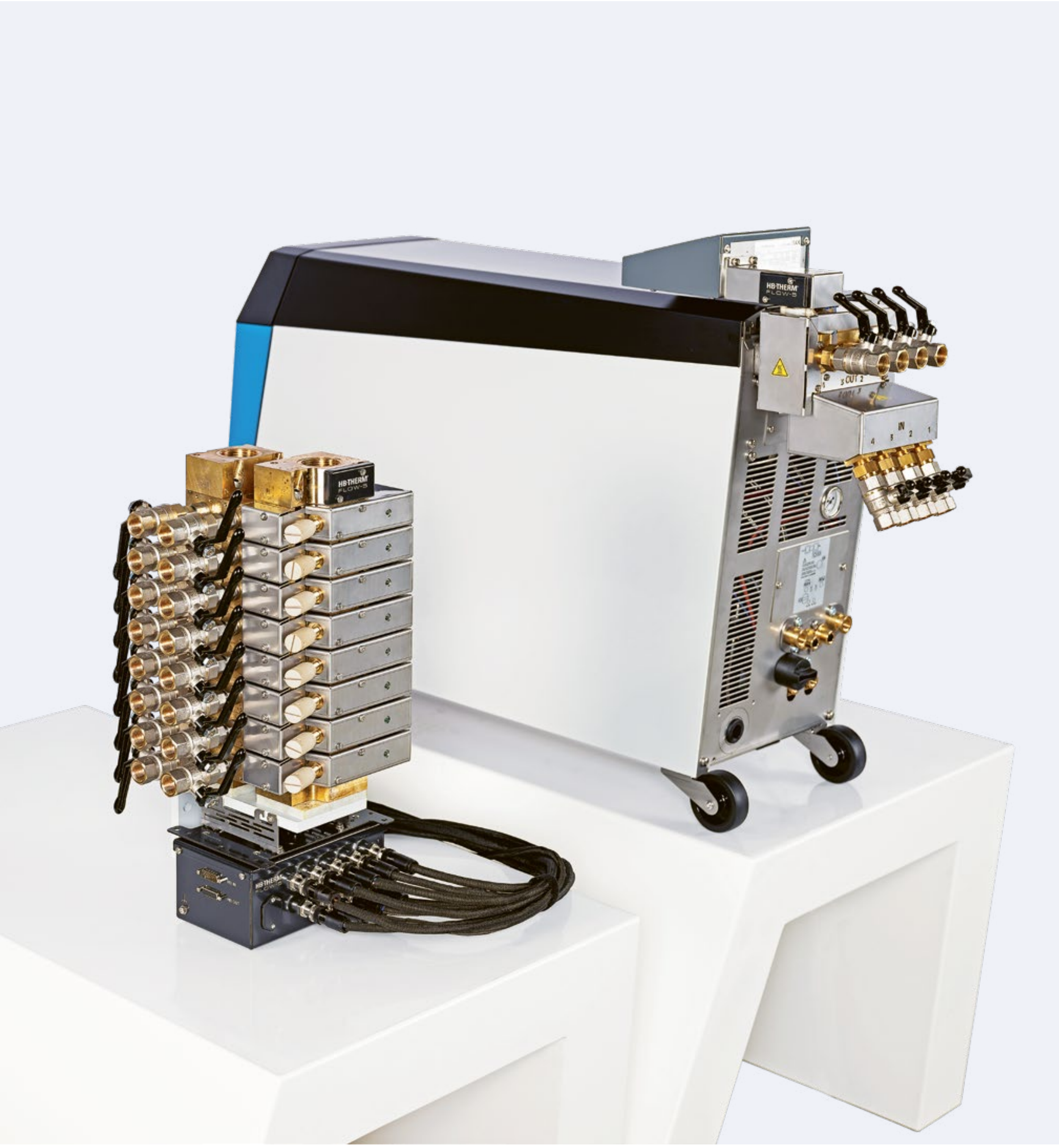
HB-Therm®

Flow-5

Flow Meter for Temperatur Control Units Thermo-6



Flow-5

Advantages of parallel-connected circuits

- → Larger overall flow
- → Smaller temperature difference between main line and return line
- → Better homogeneity in temperature distribution
- → Fewer temperature control units are required at the same temperatures

Broad range of applications

Suitable for applications with water up to 160 °C or 180 °C.

Various models with 4 to 16 circuits allow for flexible arrangements.

High-precision measuring principle

The Flow-5 enables precise measurements of very low flow rates starting from 0,4 L/min.

Highly accurate ultrasonic flow rate measurement is considered one of the fastest measuring principles.

Safe and comfortable

Fully automated process monitoring with continuous control of flow and temperature per circuit.

Display of circuits on machine control (manufacturer-dependent).

Durable and low-maintenance

Flow rate measurement without any moving parts, made entirely of corrosion-resistant materials.

Early detection of flow changes protects your equipment and minimises the effort needed for maintenance of blocked channels.

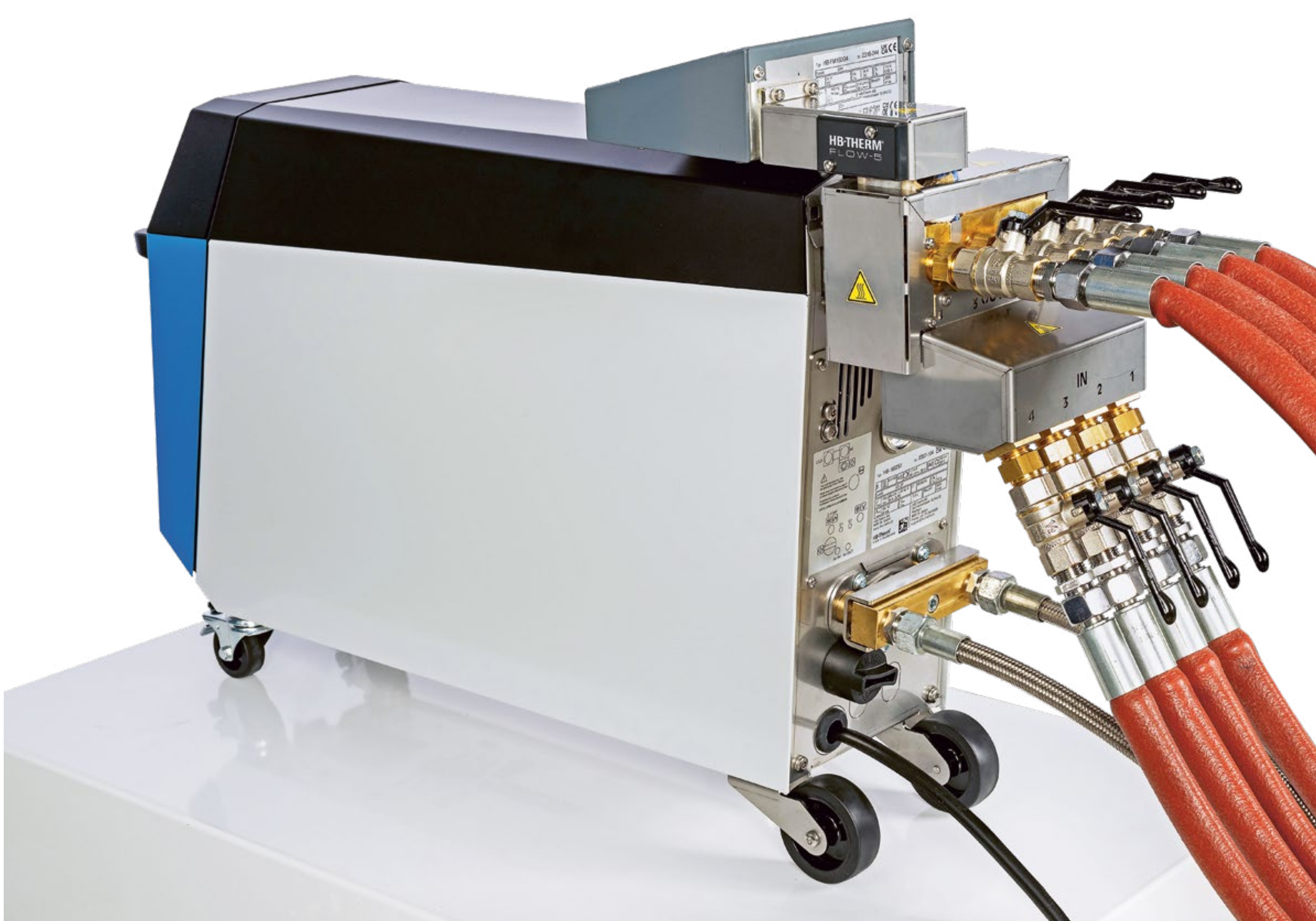
Flow-5

In parallel connected circuits flow changes might remain undetected as the flow of medium is distributed among the remaining channels.
External flow meters Flow-5 monitor parallel circuits individually and detect changes early on, before production quality begins to be compromised.
The Flow-5 are easy to operate and provide highly accurate ultrasonic measurements.

Flow-5 –
Unit attachment

Flow-5 –
Autonomic assembly

Parallel vs. Serial	→ Larger overall flow → Smaller temperature difference between main line and return line → Better homogeneity in temperature distribution
Precise and safe	→ Early detection of flow changes → Highly accurate ultrasonic flow rate measurement → Smallest flow rates from 0,4 L/min
Versatile and durable	→ high temperatures for water up to 180 °C → For temperature control units Thermo-6 and Thermo-5 → Different designs allow for flexible arrangement
Reliable and durable	→ Solely non-corroding materials in the hydraulic circuit → Flow rate measurement without any moving parts



Operation

Everything at a glance: The 7-inch IPS touch screen clearly displays the circuits. The intuitive user interface in the local language provides quick access to the desired functions.
With the fully automatic process monitoring of the Thermo-6 temperature control units, the flow rates and temperatures of each individual circuit are continuously monitored.
A help system assists you with configuration and commissioning.

Connection of Flow-5 to Thermo-6

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6TH-5FM-Connect-EN

Highlights Thermo-6 with Flow Meter Flow-5

Well-arranged and comprehensible

- Clear representation of the circuits (max. 16)
- Display of values graphically or as text
- Intuitive operation in local language

Safe and comfortable

- Fully automated process monitoring
- Continuous monitoring of flow and temperature per circuit
- Automatic limit value setting
- Display of circuits on machine control (manufacturer-dependent)

Simple and comprehensible

- Determination of process power per circuit
- Data recording

Standard Equipment

Topic		Feature
Hydraulics		Continuous maintenance-free ultrasonic flow meter
		Nominal measuring range 0,4 to 20 L/min per circuit
		4 circuits
		Hydraulic circuit made of non-corroding materials
		Common temperature sensor in the main line with sensor Pt 1000
		Temperature measuring in the return line of each circuit with sensor Pt 1000
Command / Display		Three coloured LEDs show the status of the unit
		Info button for switching display
		Determination of individual process power
		Automatic limit value setting
		Transmission of measured values to the machine control (manufacturer-dependent)
Interfaces	HB (IN)	HB-Therm data interface CAN for connecting to a temperature control unit Thermo-6 or Thermo-5
		1 socket Sub-D 15 pin (male)
	HB (OUT)	HB-Therm data interface CAN for connecting an additional flow meter Flow-5
		1 socket Sub-D 15 pin (female)
	AUX	Frequency output (20 L/min @ 200 Hz)
		1 socket Sub-D 25 pin (male)
Power supply		Power supply via interface HB from the temperature control unit
		24 VDC; 1,5 W

Additional Equipment

Designation	Code	Description
Shut-off valves	ZH	Shut-off valves for all circuits

Flow-5 –
Unit attachment

Technical Data

Specifications

Flow meter	Model		Unit attachment
	Temperature control unit		Thermo-6 *
	Heat transfer medium		Water
	Maximum main line temperature		160 °C
Type			**HB-FM160**
	Unit attachment		**G**
	Number of circuits		**4**
Additional equipment	Shut-off valves for all circuits	**ZH**	○
Accessories	Cable HB, 1,5 m		●

Ordering example: HB-FM160G4-ZH-English

● Standard specification ○ Optional * only with pump 4T/4S

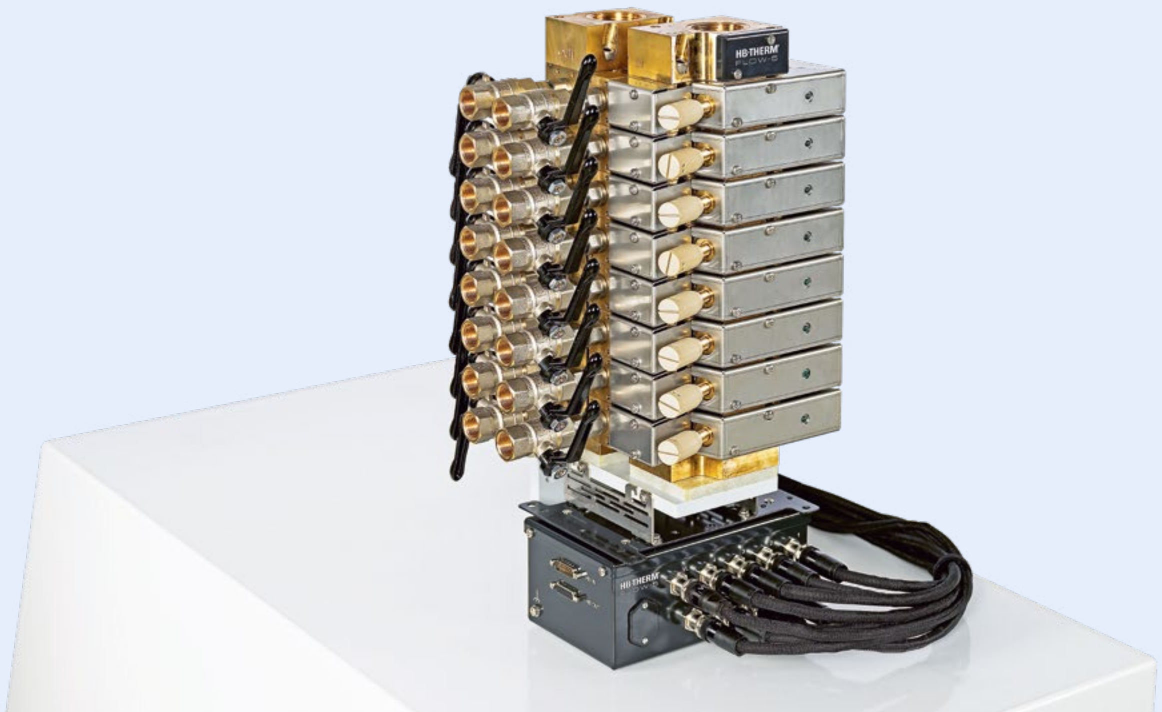
Technical data			HB-FM160G4
Nominal measurement range	Per circuit	L/min	0,4–20
Connection circuits	Thread		G½
	Resistance	bar, °C	20, 180
Dimensions	Height	mm	251
	Width	mm	180
	Depth	mm	348
Weight max.		kg	9

Standard Equipment

Topic		Feature
Hydraulics		Continuous maintenance-free ultrasonic flow meter
		Nominal measuring range 0,4 to 20 L/min per circuit
		Expansion of measuring range up to 40 L/min by parallel connection of two circuits (accessories)
		Manual flow rate setting with fine adjustment valve per circuit
		Modular-design with up to a maximum of 16 circuits
		Hydraulic circuit made of non-corroding materials
		Common temperature sensor in the main line with sensor Pt 1000
		Temperature measuring in the return line of each circuit with sensor Pt 1000
Command / Display		Signalling lights for visualising flow rates
		Determination of individual process power
		Automatic limit value setting
		Transmission of measured values to the machine control (manufacturer-dependent)
Interfaces	HB (IN)	HB-Therm data interface CAN for connection to a temperature control unit Thermo-6 or Thermo-5
		1 socket Sub-D 15 pin (male)
	HB (OUT)	HB-Therm data interface CAN for connecting an additional flow meter Flow-5
		1 socket Sub-D 15 pin (female)
Power supply		Power supply via interface HB from the temperature control unit
		24 VDC; 2,2 W/4 circuits

Additional Equipment

Designation	Code	Description
Connection for alarm	ZH	Alarm using potential-free contact (rating max. 250 VAC, 4 A)
		1 socket Harting Han 3A (male)
Shut-off valves	ZH	Shut-off valves for all circuits (without parallel connections)



Flow-5 –
Autonomic assembly   Technical Data

Specifications

Flow meter	Model		Autonomic assembly							
	Temperature control unit		Thermo-6							
	Heat transfer medium		Water							
	Maximum main line temperature		160 °C				180 °C			
Type			HB-FM160				HB-FM180			
	Autonomic assembly - Mounting left (Page 14)		L				L			
	Autonomic assembly - Mounting right (Page 14)		R				R			
	Max. number of circuits		4	8	12	16	4	8	12	16
Circuits	Number	2	●				●			
		3	○				○			
		4	○				○			
		5		●				●		
		6		○				○		
		7		○				○		
		8		○				○		
		9			●				●	
		10			○				○	
		11			○				○	
		12			○				○	
		13				●				●
		14				○				○
		15				○				○
		16				○				○
Additional equipment	Connection for alarm	ZA	○	○	○	○	○	○	○	○
	Shut-off valves	ZH	○	○	○	○	○	○	○	○

Accessories	Cable HB, 5 m	O/ID	T25066-3	T25066-3
	Parallel connection set G¾	O/ID	T26243-1	T26243-4
	Parallel connection set with shut-off valves G¾	O/ID	T26243-2	T26243-3
	Adjustable screw joint set (per circuit) G½	O/ID	T26173	T26173

Ordering example: HB-FM160L8-5-ZH-English
+ 1x Parallel connection set with shut-off valves G¾ (O/ID T26243-2)
+ 1x Cable HB, 5 m (O/ID T25066-3)

● Standard specification   ○ Optional

Technical data										
Nominal measurement range	Per circuit	L/min	0,4–20				0,4–20			
	Parallel connection	L/min	0,8–40				0,8–40			
Connection main manifold	Thread		G1¼				G1¼			
	Resistance	bar, °C	20, 180				25, 200			
Connection circuits	Thread		G½				G½			
	Threads for parallel connection		G¾				G¾			
	Resistance	bar, °C	20, 180				25, 200			
Dimensions (Page 14/15)	Height (max.)	mm	362	514	696	848	362	514	696	848
	Width (approx.)	mm	345	345	370	370	345	345	370	370
	Depth (approx.)	mm	280	280	280	280	280	280	280	280
Weight max.		kg	25	41	57	73	25	41	57	73

Connection

Installation / Configuration

Connection of Flow-5 to Thermo-6

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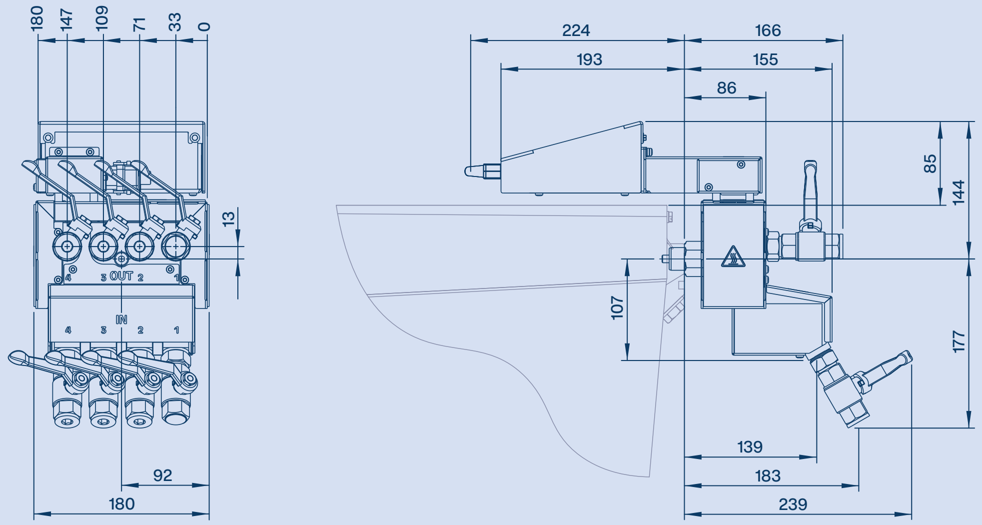
6TH-5FM-Connect-EN

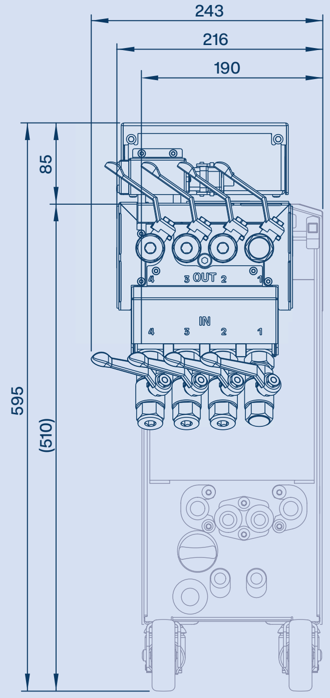
General Technical Data

Feature		Data
Environment	Temperature range	5–60 °C
	Relative humidity	35–85 % RH (non-condensing)
Colour	Control panel (unit attachment)	RAL 7012 (basalt grey)
Protection class		IP 54
Standards		EN IEC 63000, EN 61010-1, EN 61326-1, EN ISO 13732-1
Certification/Approval		CE (compliance with relevant CE directives)
Temperature measurement	Resolution	0,1 °C
	Tolerance	±0,8 °C
Flow rate measurement	Resolution	0,1 L/min
	Tolerance	±(5 % of measured value + 0,1 L/min)

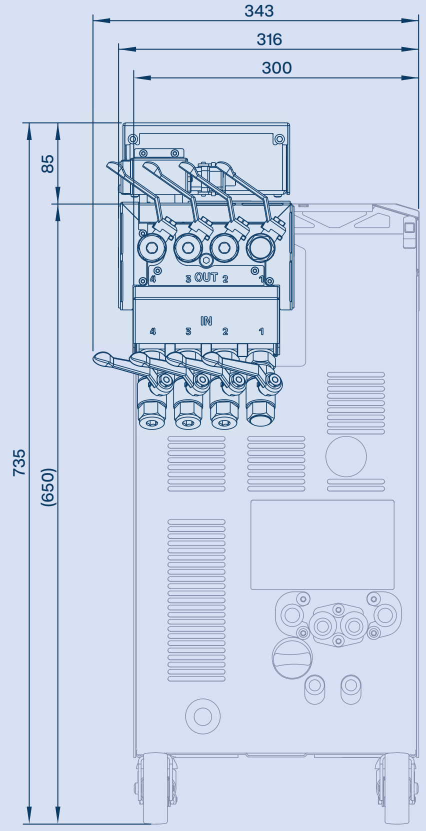
Dimensions

HB-FM160G4





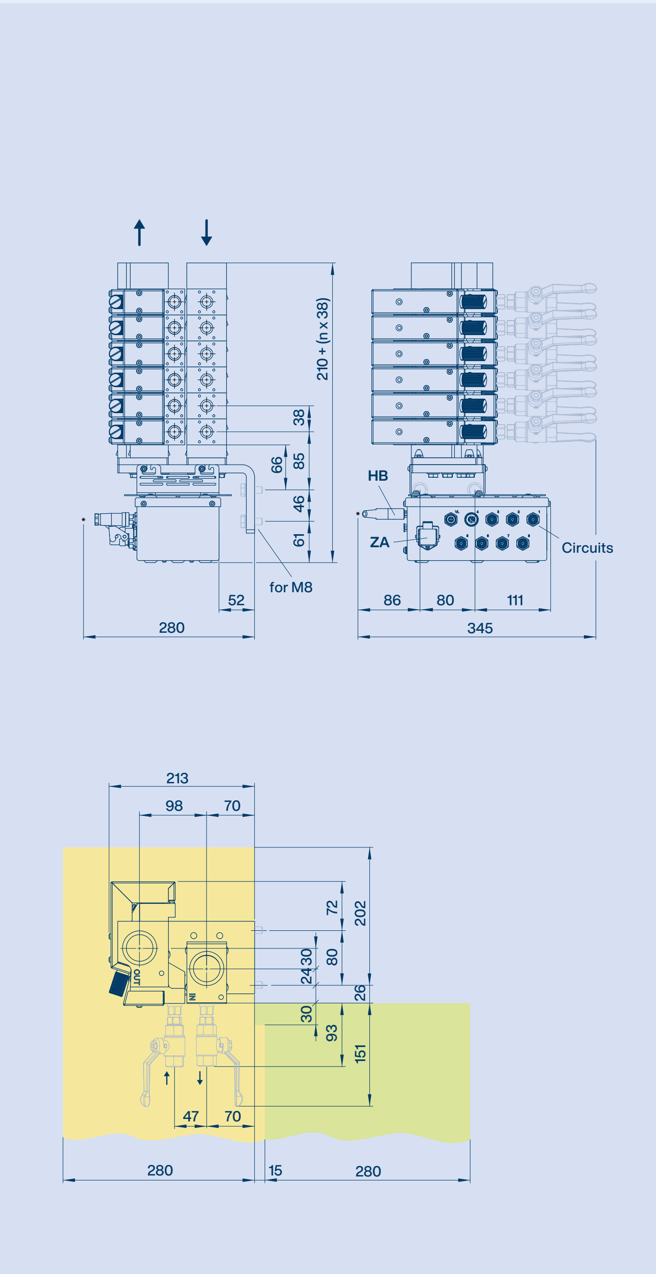
Thermo-6 –
Housing size 61



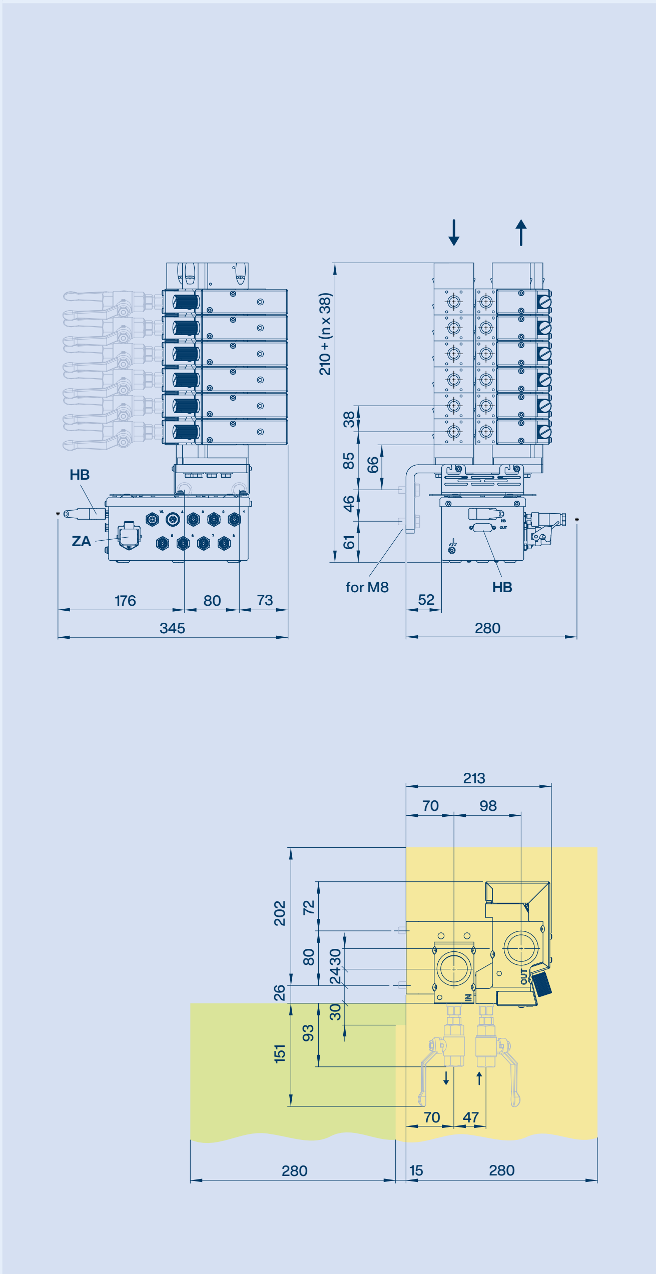
Thermo-6 –
Housing size 62

Dimensions

HB-FM160/180L (mounting left, 2–8 circuits)



HB-FM160/180R (mounting right, 2–8 circuits)



n Number of circuits
Required free space
Additionally suggested free space
1) Mounting screws M8 included

3D product models

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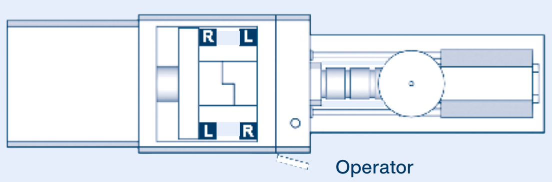
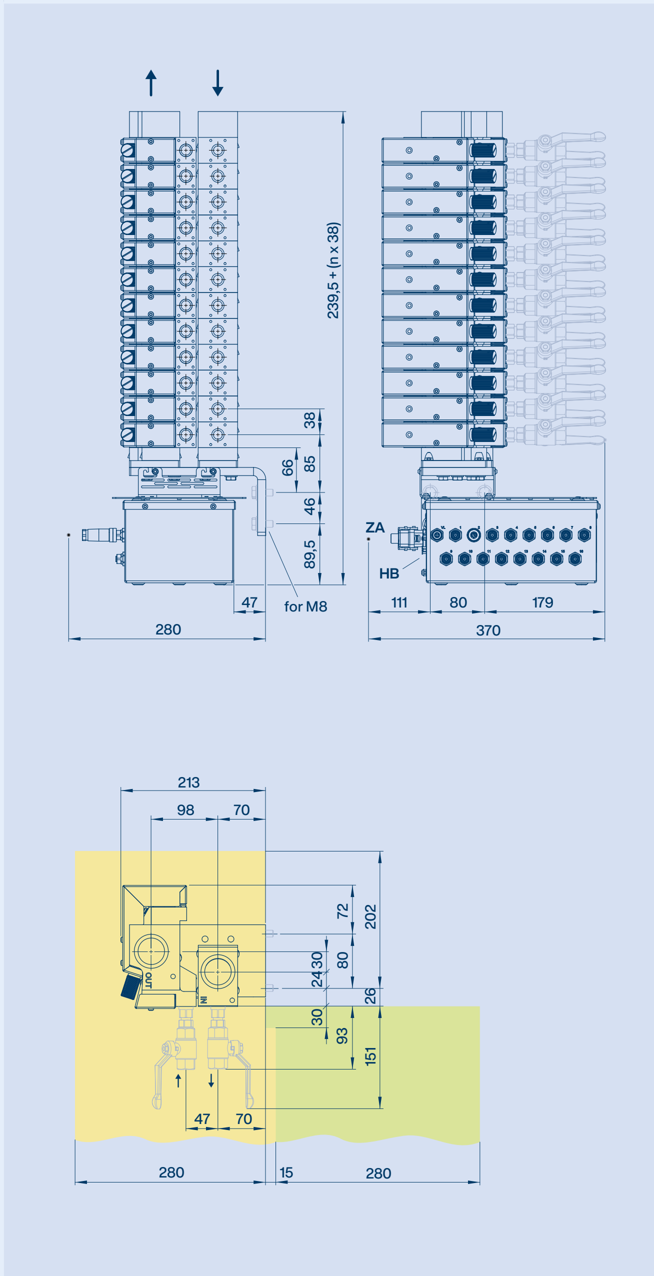
5-3D-Model-EN

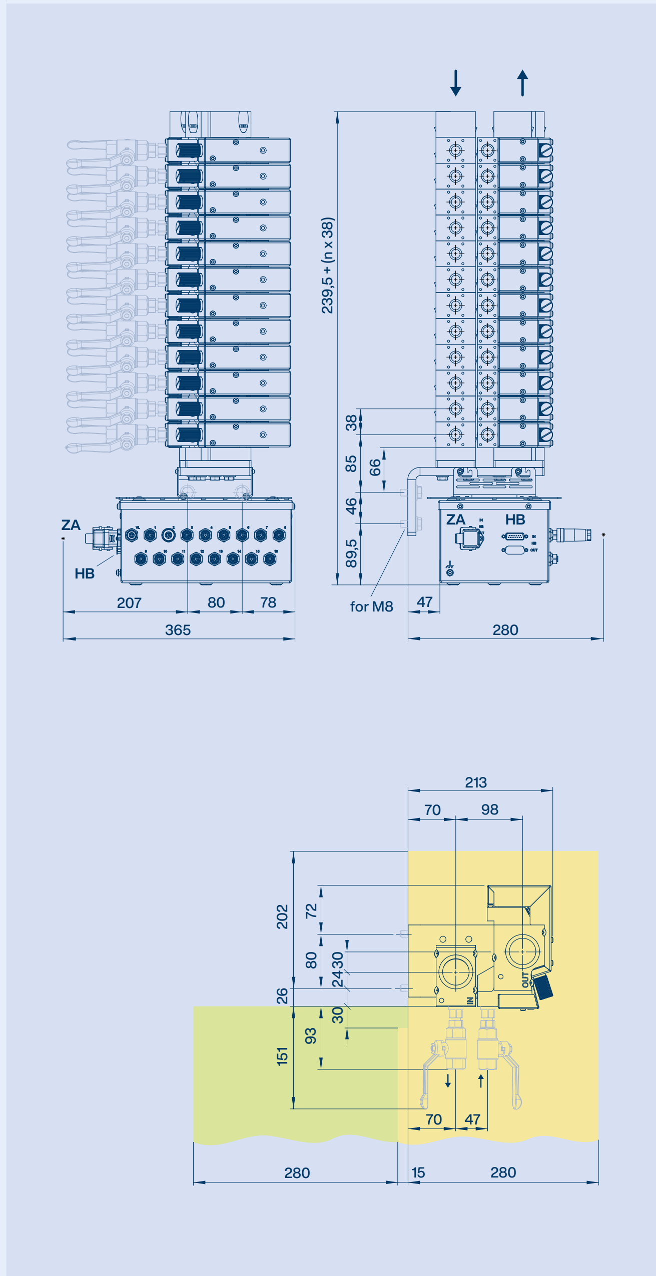
Note for mounting left/right:



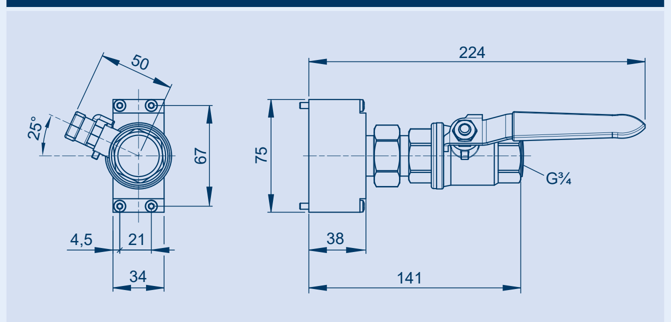
HB-FM160/180L (mounting left, 9–16 circuits)



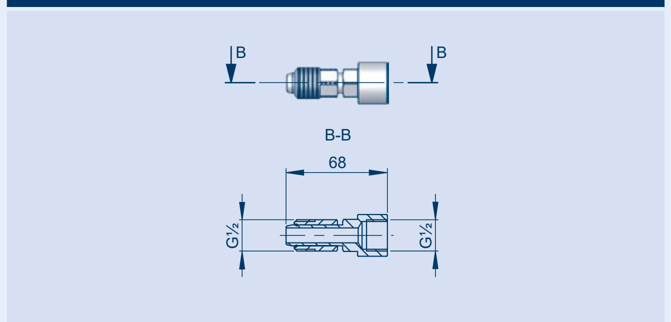
HB-FM160/180R (mounting right, 9–16 circuits)



Parallel connection of two circuits

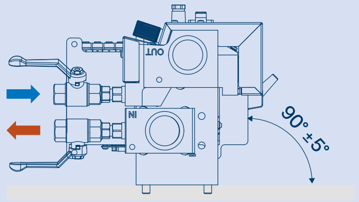


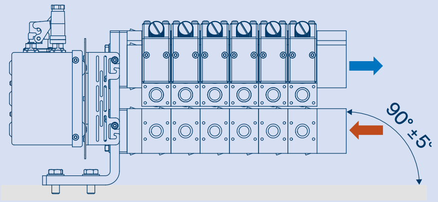
Adjustable screw joint set



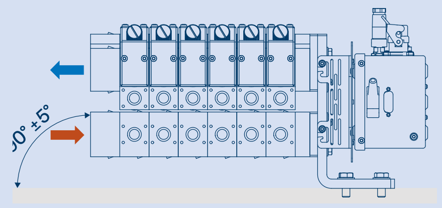
Mounting Position

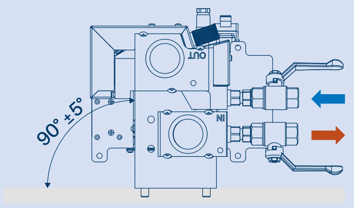
Horizontal (mounting left)



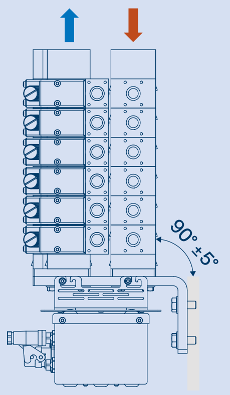


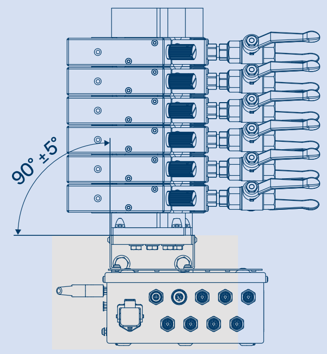
Horizontal (mounting right)



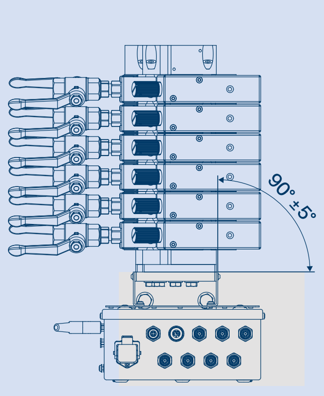


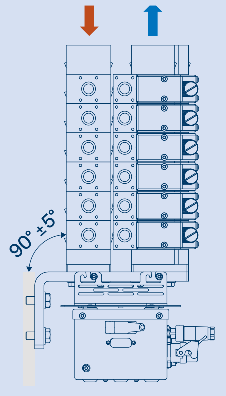
Vertical (mounting left)





Vertical (mounting right)





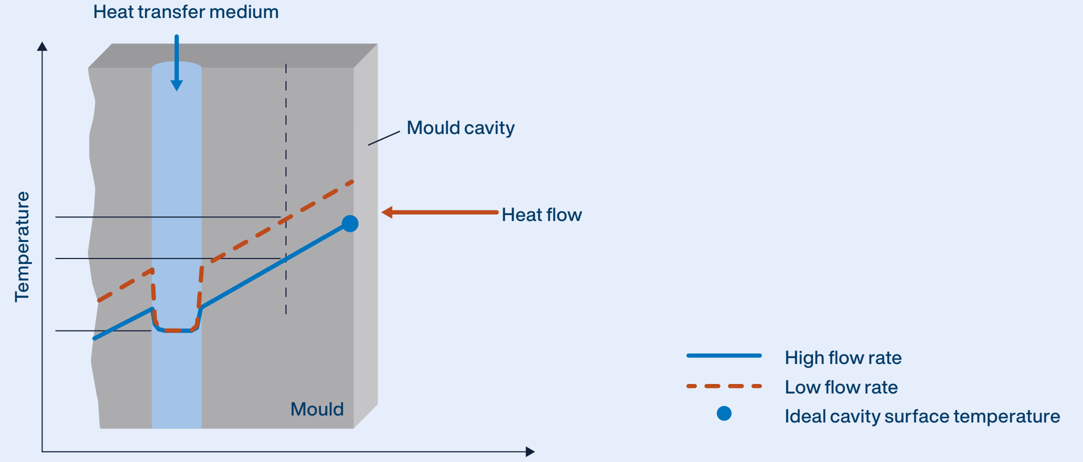
Flow Rate Measurement

Excerpt from HB-Therm Book on Temperature Control Technology

When temperature control circuits are connected in parallel in an injection mould, slight changes in the flow rates of the individual channels can affect the temperature in the mould cavity, which in turn can lead to product quality problems. Reliable measurement and monitoring of the flow rates in all parallel-connected temperature control circuits can enable the benefits of this type of connection to be exploited and ensure consistently high-quality finished parts. Depending on the application it can make sense to mount the flow meters on the temperature control unit or autonomic near the mould.

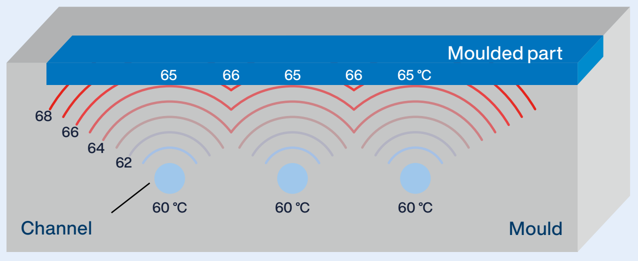
Influence of flow rate in the injection moulding process

Heat transfer at the wall of the cooling channel depends heavily on the flow conditions, which in turn are primarily determined by the flow rate. A change of the temperature difference between the heat transfer medium and the mould therefore has a direct effect on the quality-relevant temperature of the surface of the mould cavity. In the injection moulding process an even temperature distribution at the surface of the mould cavity is particular important for mould temperature control.

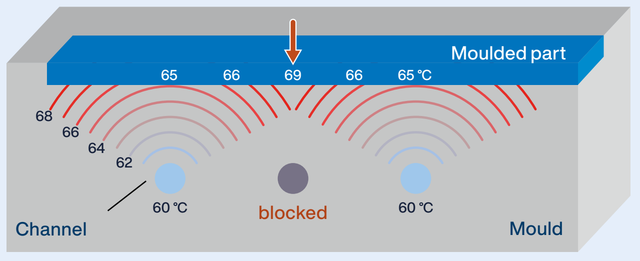


Temperature gradient in the mould for different flow rates

Partly or complete blocked channels of a circuit degrade the temperature distribution massively. Unfortunately, they cannot be detected by measuring and monitoring the main flow of the temperature control unit only.



Temperature distribution for the same flow rate in all three channels



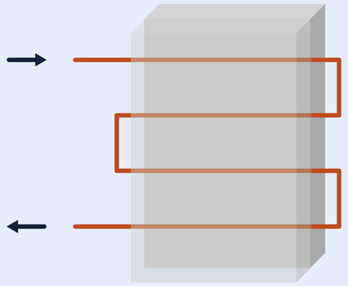
Temperature distribution when the middle channel is blocked

Flow rate measurement (continuation)

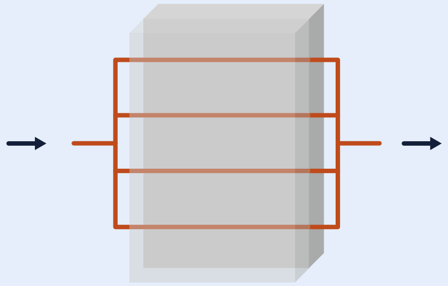
In certain cases, the temperature in the area of influence of a channel can be changed by adjusting the flow consciously. The reduction of the flow results in higher temperatures. With this technique the sensitivity of perturbation increases, what makes the monitoring of the flow of the channels essential.

Serial versus parallel connection

In applications with serially connected temperature circuits, the flow monitoring of the individual temperature control unit is perfectly adequate because the flow in all channels connected is equal. In contrast to serial systems, parallel connected temperature control circuits offer a lower pressure drop with a larger total flow rate, fast-response temperature control and more even temperature distribution as well as a smaller temperature difference between feed and return flow.

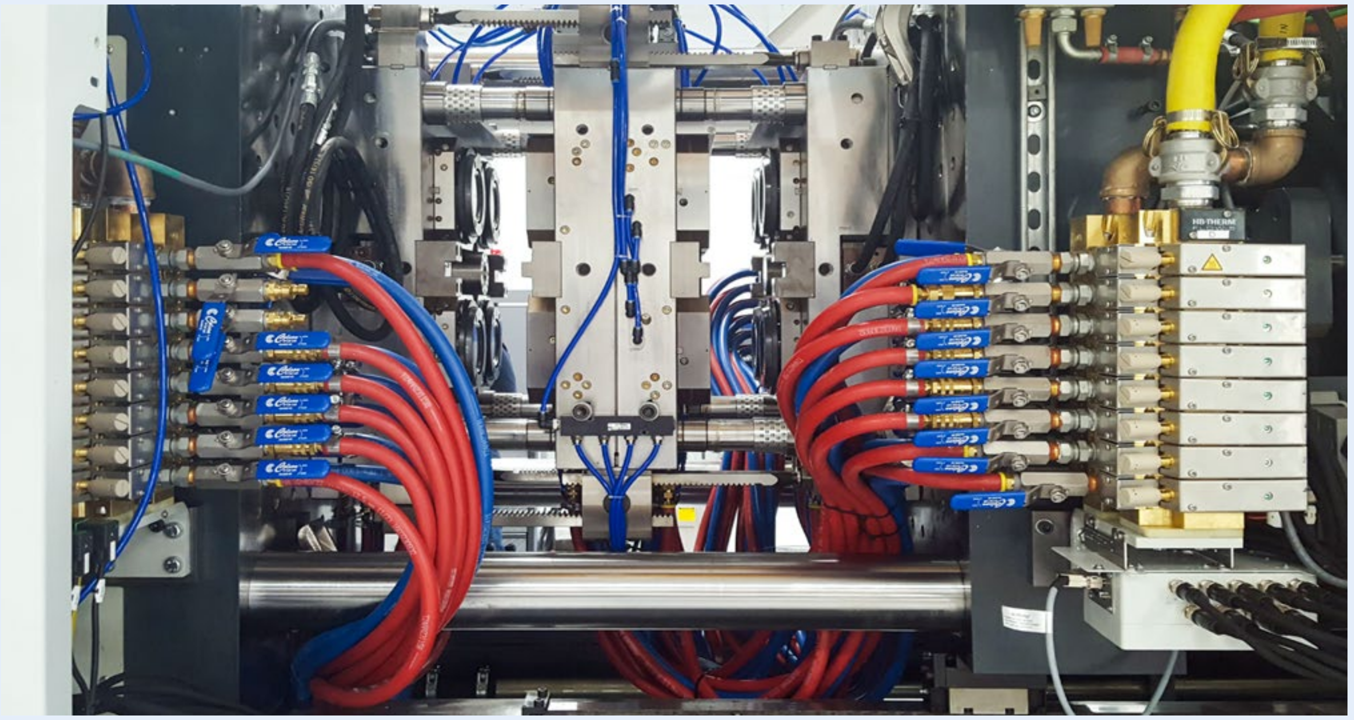


Serial connection



Parallel connection

In order to take full advantage of temperature control circuits connected in parallel, it is advisable to measure and monitor the flow rates of the individual circuits.



Flow monitoring of 16 temperature control circuits

Accessories

Electrical and hydraulic connections and other accessories.

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D8064-EN

Knowledge

“Knowledge” is our customer knowledge database. Here, you will find comprehensive information on the operation and use of our units. Access to “Knowledge” is available both through our website hb-therm.com and directly via the e-cockpit app.

Contents:
- → Manuals
- → Unit software
- → 3D product models
- → and much more.

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6-Knowledge-EN

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Website with information about the company, products, and services.

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