HB-THERM®

Product Information
External Flow Meter for Water HB-FM160-20
Edition October 2009



HB-THERM®

External flow rate measurement: detect malfunctions in parallel circuits before scrap occurs

The parallel connection of tempering circuits in an injection moulding tool doesn't only have advantages. Slight changes in the flow rates in the individual channels usually affect the temperature at the mould cavity, which is then reflected in the quality of the moulded part. A constant high part quality can be ensured by means of the reliable measurement and monitoring of the flow rates in all parallel connected circuits.

Risks of parallel connected tempering circuits

There is a large risk of the blockage of individual parallel connected tempering circuits. Above all, this problem is hard to detect. It may proceed slowly in the case of narrowing of the cross-section due to contamination, resulting in the creeping deterioration of the quality of the moulded parts. Although the flow behaviour changes faster due to kinks in connecting hoses and similar problems, in this case also the effects only become apparent with the deteriorating quality of the moulded part.

Monitoring of the flow rates in all tempering circuits

In applications with serially connected tempering circuits, it is sufficient to monitor the flow rate of the tempering device. This is integrated in HB-THERM appliances as standard. For applications with parallel connected tempering circuits, a flow rate monitoring device is also available as an accessory and is optimally matched to tempering using the HB-THERM Series 5 appliances *(fig. 1, 2)*.

The main features are:

- for applications using water up to 160 °C
- nominal measurement range 0.4 – 20 l/min.
- precise ultrasound-based measuring system with no moving parts in the return line of each circuit
- a common temperature sensor in the main line and one in the return line of each circuit
- CAN data interface for connection to HB-THERM Series 5 appliances
- frequency signals for applications without a data interface
- basic equipment for 4 circuits
- extendable up to 8 circuits using an extension block
- integrated distributor for main and return lines
- corrosion-resistant materials
- simple attachment to the appliance
- integrated measuring electronics
- operation, display and monitoring integrated in the controller of the tempering appliance
- selectable automatic setting of limit values



Fig. 2 Rear view of an HB-THERM Series 5 tempering appliance with attached flow rate meter for 4 circuits.

Thanks to the automatic limit value setting, manual setting for each mould can even be dispensed with. The values depend on the conditions following start up.

In special cases the external flow rate meter can be installed detached. The type of installation, fixing and connections must be clarified according to the specific application.

One frequency signal is available per circuit for applications without a data interface.

Technical background

The transfer of heat at the wall of the tempering channel is strongly dependent on the flow conditions, which are primarily determined by the flow rate. The changing temperature difference between the heat carrier and the tool is apparent to the same degree at the surface of the mould cavity. The flow rate therefore has a direct influence on the temperature at the surface of the mould cavity, which is an important quality factor *(fig. 3)*.

Fig. 1 (cover picture) Front view of the attached flow rate meter showing the electrical interfaces.

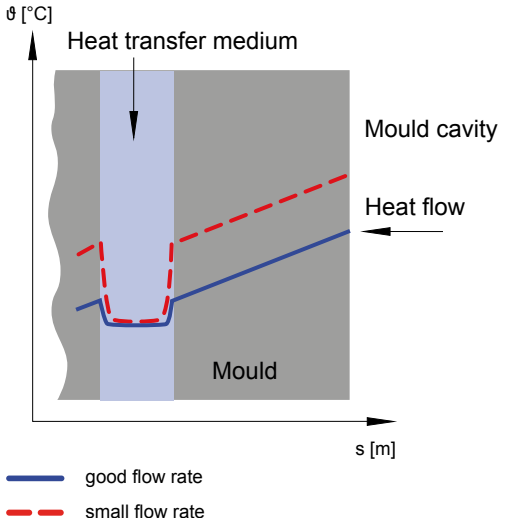


Fig. 3 Temperature curve in the mould at different flow rates

If the flow rate now changes in one of the parallel connected circuits, the tempering error increases via the surface of the mould cavity due to the poor temperature distribution *(fig. 4, 5)*.

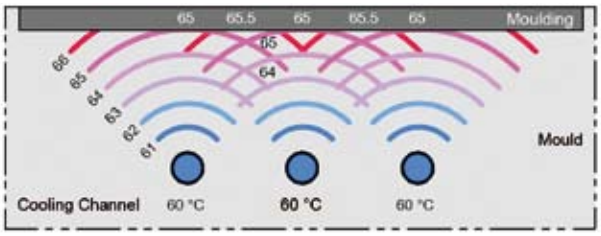


Fig. 4 Temperature distribution for the same flow rate in all three channels

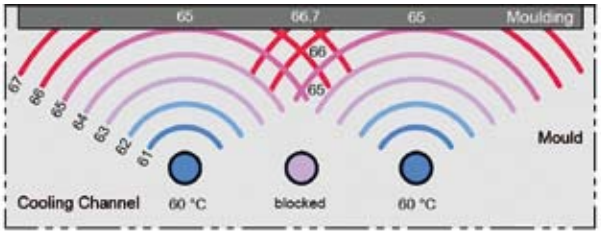
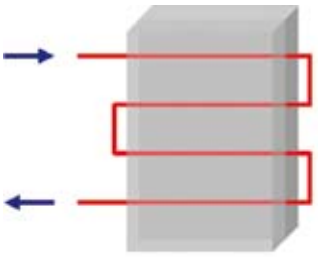


Fig. 5 Temperature distribution when the middle channel is blocked

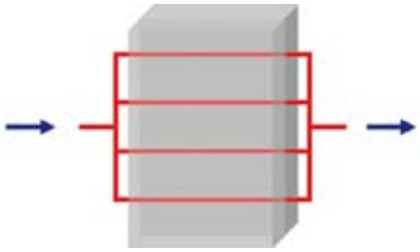
Serial vs. parallel connection

As figs. 6 and 7 show, both types of connection have their advantages.



- same conditions for all channels
- low risk of blockage
- high process reliability
- simple monitoring (flow rate, tool temperature)
- simple connections

Fig. 6 Circuits connected in series



- small pressure drop
- small temperature difference

Fig. 7 Circuits connected in parallel

CONCLUSION:

- Serial connection is preferred in order to reduce the risk of blockage
- If parallel connection has to be used for other reasons, the flow rates of the individual circuits must be measured and monitored.

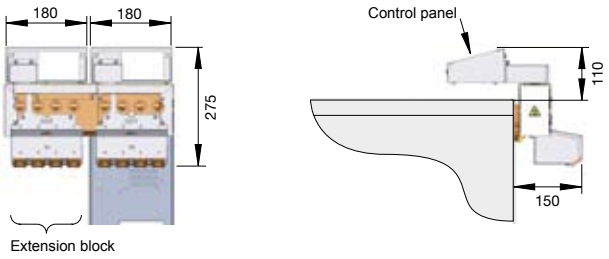
User benefits

The main benefit of the external flow rate meter is that it can monitor individual parallel connected circuits. The monitoring of these production parameters is a further step towards controlling the quality of the moulded parts.

An additional benefit when used with Series 5 devices is that the effective tempering performance of each circuit can be displayed. This is possible because each circuit is equipped with its own temperature sensor in the return line.

Device attachment Series 5 for housing size 1 and 2 (max. 2 distributor blocks)

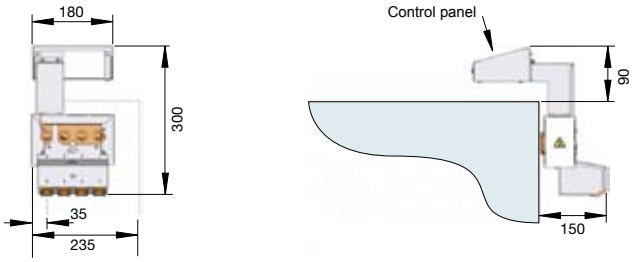
To connect external flow meters to temperature control units Series 5 additional equipment **ZI** (Interface HB-THERM internal) is required.



	O/ID-No.
Flow meter HB-FM160-20	24853
Flow meter HB-FM160-20 extension block	24854

Device attachment Series 4 for housing size 1 and 2 (max. 1 distributor block)

To connect external flow meters to temperature control units Series 4 additional equipment **ZV** (Interface MAXI) is required.



	O/ID-No.
Flow meter HB-FM160-20 with euroadapter (power supply)	24877

Technical Data

Heat transfer medium		Water
	max. temperature	160 °C
Pressure resistance		20 bar
Nominal measurement range	per circuit	0,4-20 L/min
Supply		24 VDC; 1,2 W
Connection, main/return line	Circuits	G ½
Environment	Temperature	5-70 °C
	Humidity	0 – 95 % RH (non-condensing)
Colour	Control panel	RAL 7012 (basalt grey)
Weight		9 kg
Protection class		IP 43
Standards (most important)		EN 60204-1, EN 61000-X
Certification / Approval		CE (compliance with relevant EC directives)
Tolerance	Flow indicator	±5 % of measured value

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