

# SINGLE Alternating Temperature Technology



**SINGLE ATT 'Alternating Temperature Technology' is an individually configured system solution for liquid-operated variotherm temperature control of injection moulds, compression moulds and other mould types. As the active system fills moulds alternately with warm and cold thermal fluids, it can actively heat or cool processes in defined alternation.**

Variotherm temperature control used in combination with suitable mould inserts allows variations in temperature of more than 100 °C in critical areas or in complete moulds. In order to achieve this, the SINGLE ATT system operates with two separate circuits that contain thermal fluid with a different temperature. Both ATT circuits contain the same fluid. Water is recommended for temperatures of up to 200 °C, while oil is suitable for applications that operate with temperatures of up to 300 °C.

## AREAS OF APPLICATION

- ▶ Injection moulding of thermoplastics
- ▶ Production of components made from fibre-reinforced composites
- ▶ Other cyclic processes with temperature profile

## STANDARD EQUIPMENT

### General

- ▶ Temperature control system with one heating and one cooling circuit and circuit switch
- ▶ Fast alternation between heating and cooling circuit thanks to hydraulic switching
- ▶ Energy-saving temperature-controlled feeding of return fluid into the corresponding circuit
- ▶ Easy operation with touch screen
- ▶ Connection to standard moulds
- ▶ Rugged, powder-coated steel sheet housing

### Hydraulics

- ▶ High-quality materials and reliable components
- ▶ Wear-free flow metering and flow monitoring
- ▶ Hose connections between system and valve station

### Electric and control equipment

- ▶ Programmable logic controller with touch screen
- ▶ Heating control by solid state relay with fail-safe pilot contractor
- ▶ Electronic safety temperature limiter
- ▶ Switch box to IP54

## OPTIONS

- ▶ Remote control via remote touch screen or via Ethernet-based PC
- ▶ Connection for 20 mA current loop (TTY)
- ▶ Hose connections between valve station and mould
- ▶ Data logging via integrated USB interface

**single**  
first choice  
in temperature control



### CYCLE-BASED CONTROL

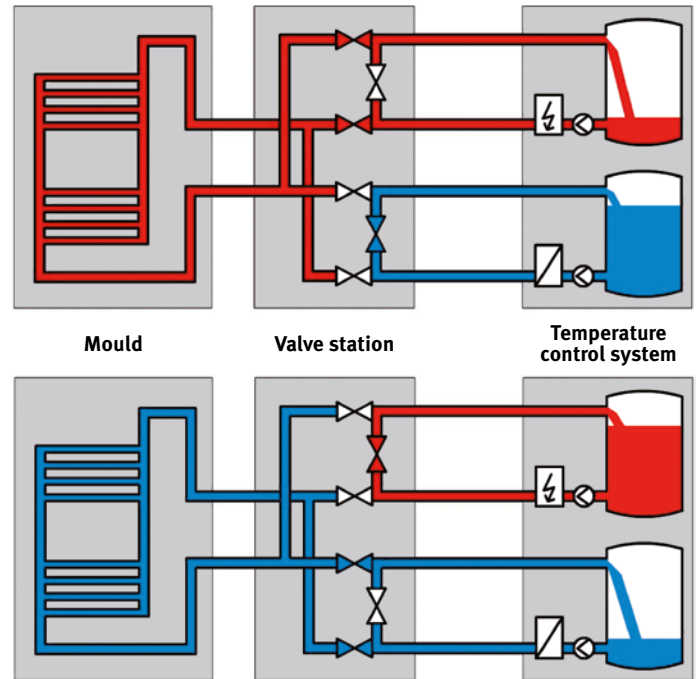
The system is equipped with up to four external valve stations for switching the two circuits from bypass mode to mould temperature control mode. User-defined time setting and free selection of maximum or minimum temperatures per mould section allow the energy consumption of the temperature alternation process to be optimised.

Signals for the switch-over from cooler to warmer medium are transmitted by the machine control via programmed I/Os according to process requirements.

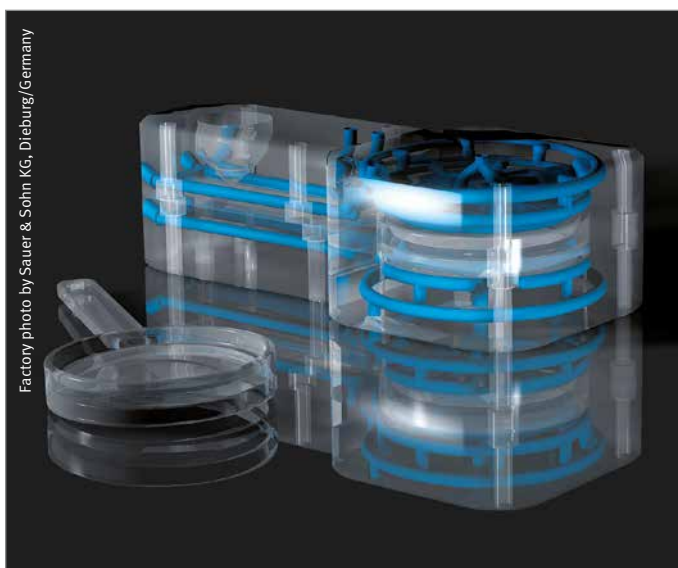
### MORE EFFICIENCY THROUGH CONTOUR-ALIGNED COOLING CHANNELS

Mould design is a significant factor that affects the efficiency of variotherm temperature control. In order to promote fast temperature changes, moulds are recommended to combine an effective thermal conductivity with low weight and a good heat transfer to the cavity.

Therefore, ATT is ideally used in combination with mould inserts with contour-aligned heating/cooling channels. These inserts or components can be produced by generative methods using layer-by-layer construction from steel powder from data supplied by a 3D-CAD volume model. This way, even cooling inserts with highly complex geometries can be produced quickly, cost-efficiently and with high accuracy.



*Schematic diagram: Warm fluid heats the mould during the filling phase while cold fluid cools it during the cooling phase*



Factory photo by Sauer & Sohn KG, Dieburg/Germany

*Mould insert with contour-aligned channel*



*Product specimen made from PC/ABS*



### BENEFITS OF ATT FOR INJECTION MOULDING PROCESSES

Variotherm mould temperature control has a variety of benefits that positively affect processes, part surfaces, part strength and the cost-efficiency of production processes. ATT

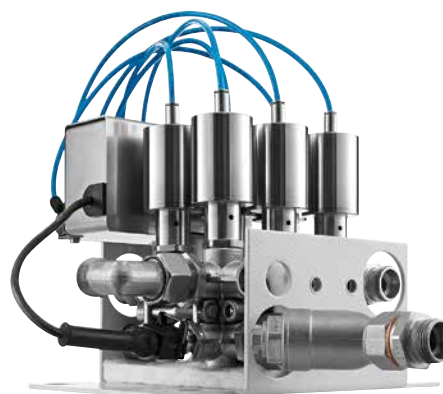
- ▶ prolongs the holding pressure even in areas that are away from the gate and helps reduce injection pressure and clamping force,
- ▶ decreases internal stress during compression moulding of thick-wall optical components,
- ▶ enhances surface properties such as self-cleaning or antireflection coating, the reproduction of microstructures and nanostructures as well as the production of particularly smooth and high-grade glossy surfaces with piano finish,
- ▶ introduces a better homogeneity of glass fibres in technical parts,
- ▶ increases the welding time for melt fronts and reduces the occurrence of weld lines,
- ▶ reduces the risk of warpage caused by shrinkage and improves the dimensional stability and consistency of injection moulded parts and
- ▶ cuts cycle times thanks to longer wall contact of melt agglomerations with the result of an intensified cooling action.

### BENEFITS OF ATT FOR PROCESSING FIBRE-REINFORCED COMPOSITES

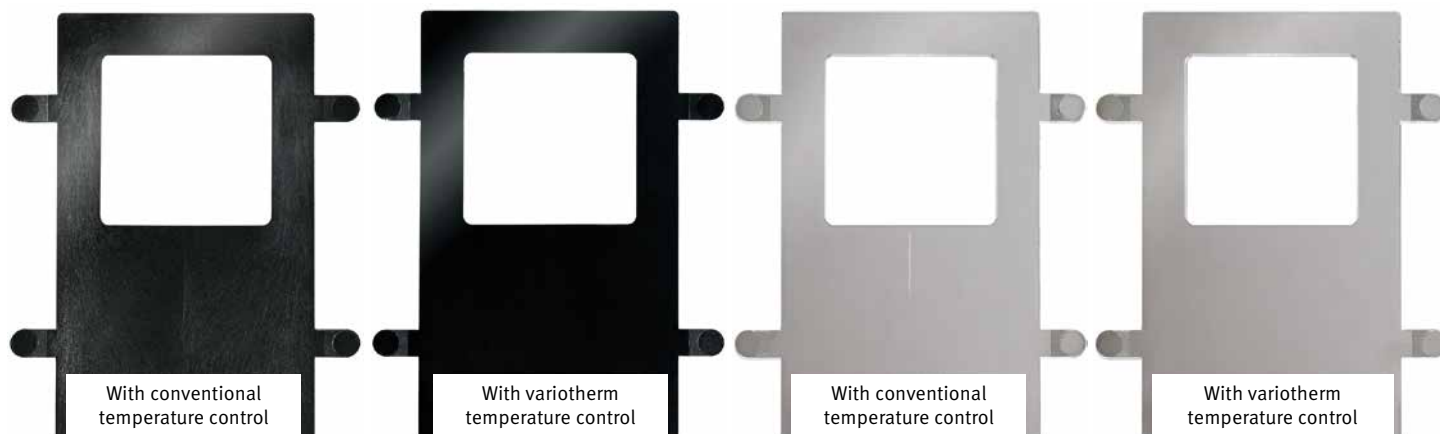
Variotherm mould temperature control also has a variety of benefits that positively affect the process, part stability, surface quality and cost-efficiency of thermoset processing and composite structure production. It cuts cycle times by optimising the process stages thanks to faster curing and subsequent cooling.



*ATT system of the Water Advanced product family*

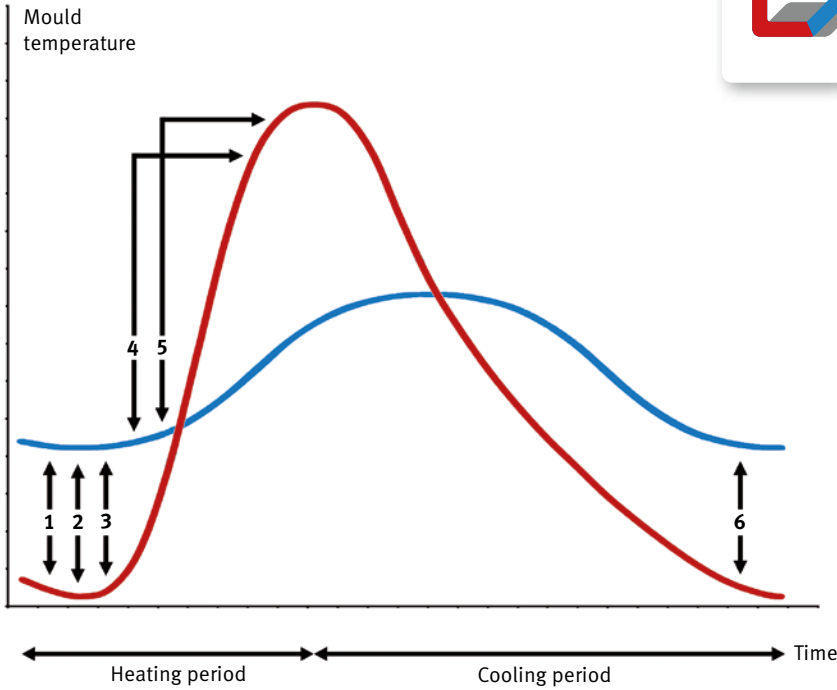


*Compact valve station for mould-aligned installation*



*Product specimen made from polycarbonate type Lexan. Left: black PC-GF9, right: transparent PC*

# SINGLE Alternating Temperature Technology



- 1 Open mould
- 2 Remove part
- 3 Close mould
- 4 Injection
- 5 Holding pressure
- 6 Open mould (next cycle)



Cycle time of ATT Alternating Temperature Technology vs. cycle time of standard system

ATT										
Structural units		K	N1		S		G	H0	H1	H2
Max. temperature range	°C	160	150	180	150	180	180	200	200	200
Max. external volume	l	1.5	4	3	10	7	14	4	6	10
Heating capacity heating circuit	kW	12/18	24/36		48		72/144	36	36	48
Cooling capacity cooling circuit (80 °C flow/15 °C cooling water)	kW	50	50		100		150	50	200	100
Maximum flow rate	l/min	60	75		150		400	60	100	200
Maximum outlet pressure (Characteristic maximum values)	bar	6	7.3		7.5		7.1	6	8.0	8
Pump capacity	kW	1	1,1		2,2		4	1	2,8	4
Valve station supply		AD 22-L	AD 22-L		DN 32		DN 50	AD 22-L	AD 28-L	DN 32
Valve station outlets		G 3/4"	G 3/4"		DN 32		DN 50	G 3/4"	AD 28-L	DN 32
Cooling water supply		14 mm	21 mm		G 1"		G 1 1/2"	21 mm	G 3/4"	G 1"
Dimensions	L	mm	840	1105	1350	1715	1105	1400	1400	
	W	mm	620	635	755	1230	635	755	755	
	H	mm	765	1120	1180	1730	1120	1200	1200	
Approximate weight	kg	130	220		400		1000	240	600	600