PSG Plus Cooler

MAK 20

Application

The compact sample gas treatment systems of the **MAK 20** series are used for drying sample gases to exclude condensation in the analyzers. Stable dew points of less than 3°C can be guaranteed even with highly fluctuating volume flows with different humidity contents. Volumetric errors or errors caused by H2O cross sensitivity of analysis methods are thus largely eliminated. The **MAK 20** series is also characterized by an optimized JET heat exchanger system in that the leaching of water-soluble gases such as SO2 is reduced to a minimum, which leads to a significant improvement in the analysis results.

Technology

The precise proportional temperature control in combination with the long-lasting hot gas bypass system and the innovative corrosion-resistant heat exchangers achieves low, extremely constant dew points. Load fluctuations and high thermal loads are also reliably compensated. The hydrophobic surface and the very short residence time of the gas in the heat exchanger ensure the lowest possible gas solubility rates.

Functions

An electronic system monitors dew point and cooling air temperature. Potential-free alarm contacts enable remote monitoring of the device. The operating parameters are stored in a logbook for diagnostics. An operating hour counter monitors the service intervals.

- ✔ Optimized jet stream heat exchanger principle
- ✔ Lowest leaching of measurement gases
- ✔ Powerful compressor cooler with 792 KJ / h cooling capacity
- ✔ The heat exchanger can be changed without opening the housing
- ✔ Gas flow 1 x 150 l / h, 2 x 150 l / h or 1 x 250 l / h (by connecting the heat exchangers in series)
- ✔ Long-lasting hot gas bypass system without switching the compressor
- ✔ Corrosion-resistant PVDF heat exchangers
- ✔ Compact design
- ✔ Digital display for temperature, alarms, logbook, operating hour counter and service interval display
- ✔ Potential-free contacts for operational monitoring, alarm and moisture breakthrough
- ✔ JET heat exchanger in BCR sample gas cooler also available for ATEX Zone II

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PSG Perfect Sample Gas

Technical Data

Model							
Type		MAK20-1	MAK20-2	MAK20-3	MAK20-4	MAK20-1 PS	MAK20-2 PS
Article		MAK20-1101-4-00-F	MAK20-1202-4-00-F	MAK20-2303-5-00-F	MAK20-2404-5-00-F	MAK20-1112-5-00-F	MAK20-1224-5-00-F
Number of gas paths		1	2 (1)*	3	4 (2)*	1	2
Number of condensate pumps		1	2	3	4	2	4
Number of pre-separators		0	0	0	0	1	2
Docking station		-	-	Yes	Yes	Yes	Yes
Material of the gas path							
Refrigeration transfer / memory		Aluminum insert / copper pipe					
Cooling surface		PVDF					
Enclosures / seals		Pvdf / viton					
Operating							
Gas flow rate Vn[1)] at 60°C Tp	L/h	1 x 150	2 x 150 Or 1 x 250*	3 x 150	4 x 150 Or 2 x 250*	1 x 150	2 x 150 Or 1 x 250*
Gas temperature at the entrance	°C	Max. 140					
Ambient temperature	°C	+5 to +50					
Pressure	Ba	0,2 to 2,2					
Gas dew point at the outlet[1)]	°C	3,0 ± 0,3 under constant conditions					
Dead volume per gas path	Ml	27					
Operational readiness	Mi	< 5	< 10	< 15	< 15	< 5	< 10
Cooling	KJ/	792					
Design data							
Dimensions (W x H x D)	M	310 x 266 x 321		449 x 266x 321			
Weight without options	Kg	19	19,5	21,8	22,3	20,3	20,8
Housing		Wall montage / RAL 9003					
Connections		Gas: PVDF DN 4/6 / Condensate : PVDF DN 4/6 or DN 10/12					
Electrical data							
Power supply		Power cord					
Digital display		Temperature (output dew point or environment), operating status, alarm and alarm memory, service monitoring, operating hours, condensate pump control					
Alarm limits	°C	< +2.0 / > +10.0					
Enclosure protection type		IP 20 EN 60529 / EN 61010					
Conformity		CE /cMETus.					
Power supply		230V 50/60Hz or 115V 50/60Hz					
Power consumption	W	190 - 220		200 - 220		210 - 230	

[1)] at 25°C ambient temperature
[*)] by connecting two heat exchangers in row, a higher gas flow is made possible
Tp = input dew point

Options

- Condensate pump
- Glass fiber or PTFE-filter, length 70 mm
- Sample gas pump N86 IP00
- Flow meter for max. 150 or 250 l/h
- Flow meter with light barrier and evaluator electronics
- Humidity sensor internally or externally incl. evaluating electron
- Pre-separator incl. condensate pump (only with docking station)
- Acid dosing incl. condensate pump
- Docking Station
- Voltage 115V 50/60Hz

Due to the large number of options, a variety of individual configurations of the MAK20 are possible. Basically, devices with 3-4 heat exchangers, 3-4 condensate pumps, 1-2 sample gas pumps, 2 filters and 2 flow meters, 1-2 pre-separators always require the docking station. This changes the device width from 310mm to 449mm. For a specific configuration of a MAK20, please contact our sales team in Steinbach.

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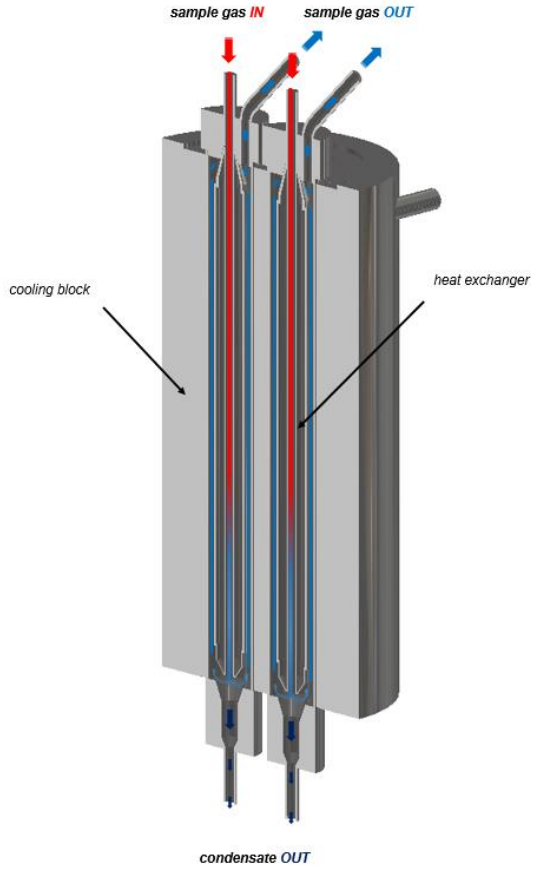
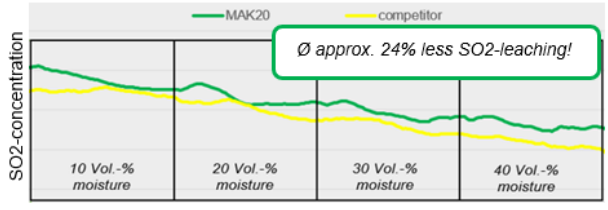
MAK 20 Heat Exchanger – System





moisture content of the measuring gas

More efficiency, no energy losses, even at high ambient temperature

- Refrigeration transmission by copper and aluminum
- Proven jet-stream operating principle
- Compact design
- Optimal shielding against the environment

High and constant drying rate even in extreme load fluctuation

- Hydrophobic surface
- Consistent use of gravity
- Immediate dissipation of the condensate from the gas stream

Exceptionally low gas solubility rates enable accurate analysis

- Very low dead volume
- Extremely short residence time of the gas in the system
- Reduced reaction time of the gas to the condensate

Reliability and long-term stability reduce maintenance and costs

- Alternating heat exchanger
- Very good chemical resistance
- No abrasive wear
- Self-cleaning effect, no contamination
- Maintenance-free system
- Proven and safe technology
- Monitored quality

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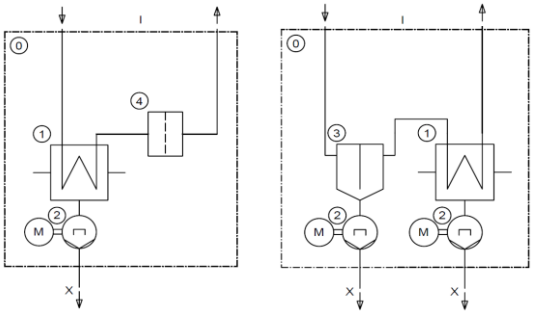
MAK 20 model example

MAK20-2

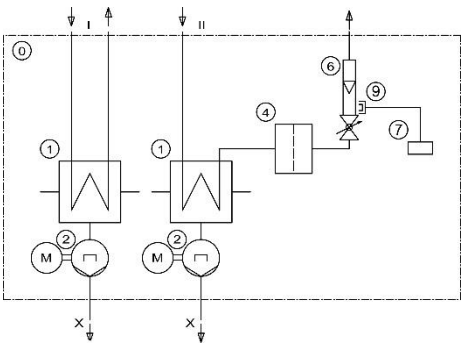
- 2 heat exchanger PVDF
- 2 gas paths (2 x 150 l/h or 1 x 250 l/h)
- 2 condensate pumps
- 1 MAK- alarm contact

Configuration examples

MAK20-1



MAK20-2



① Heat exchanger
② Condensate pump
③ condensate pre-separator
④ Depth filter
⑤ gas pump
⑥ Flow meter
⑦ quality electronics
⑧ humidity monitors
⑨ light barrier flow monitoring

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Integrated Components / Options

Condensate pump

- ✔ Reliable continuous condensate disposal
- ✔ Low speed, long-lasting pump hose

Condensate pre-separator

- ✔ Deposition of free condensate and solids
- ✔ Measuring gas pre-cooling for input dew points >65°C

Teflon Depth Filter

- ✔ Reliable solid particle filtration
- ✔ Easy and fast filter element change

Flow meter

- ✔ Optional with light barrier
- ✔ Precise dosing, with needle fine regulating valve

Liquid sensor

- ✔ Protects against condensate breakthrough
- ✔ Safe detection of even the smallest amounts of liquid

Electronics

- ✔ Control / Alarm for humidity sensors / light barrier
- ✔ Potential-free switching contact

Sample gas pump

- ✔ Unadulterated conveying of measuring gases
- ✔ Perfect integration into the cooler

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