SAMPLE GAS CONDITIONING
MAK 10 PELTIER (thermo-electric)

Performance, reliability and sustainability for extractive analytics
AIR|GAS|THERMOTECHNIK

50 years experience in sample gas and compressed air technology

With over 35,000 units installed worldwide AGT Thermotechnik is for more than 50 years a leader in gas conditioning equipment that is based on cooling technique.

We are a certified manufacturer according DIN ISO 9001:2008 and guideline 94/9/EG (ATEX).

Our enterprise came out from the 1961 founded VIA GmbH. Today AGT Thermotechnik is a supplier of well-known analysis technique systemhouses, engineering companies and compressor manufacturers. We engineer and manufacture:

- **Sample gas coolers**
  for emission- and process-gas analytics
- **Compressed air dryers**
  for pneumatic applications

SAMPLE GAS CONDITIONING

Performance, reliability and sustainability for extractive analytics

Sample gas coolers of AGT Thermotechnik can be used universally. They are worldwide integrated into many gas analysis systems of industry and crafts, as well as of research and educational institutions. They feed analyzers of leading manufacturers (eg ABB, Fuji Electronics, Gasmet, Horiba, Servomex, Sick, Siemens, etc.) with pure dry sample gas.

Broad spectrum of application in emission monitoring and process control

- Power plants
- Cement manufacturing
- Waste incinerators
- Chemical production plants
- Gas production plants
- Glass manufacturing
- Timber processing
- Food processing

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MAK10 SAMPLE GAS COOLER

Application

MAK10-Peltier sample gas coolers are designed to lower the sample gas dew point and to separate vapor from the humid sample gas flow. A typical application is to provide a constant and dry sample gas flow to moisture intolerant gas analyzers.

MAK10-Peltier are low-maintenance and powerful thermo-electric coolers with innovative heat-exchanger systems.

With optional equipment (pre-separator, filter, moisture sensor, flowmeter, sample gas pump) MAK10-Peltier sample gas coolers can be upgraded to compact integrated conditioning systems. The flexible modular design ensures an optimal integration into every analytic system.

Technology

The precise electronic temperature control and the innovative heat-exchanger systems guarantee deep and stable dew points even under operating data fluctuations as well as high thermal loads.

For a cooling performance in line with alternating operating conditions, the peltier-elements are not simply switched on/off. They are supplied with a permanent, modulating voltage. This prevents wear on the peltier-elements and guarantees a consistently high energy performance over the entire service life of the cooler.

Function

An electronic system monitors dew point and cooling air temperature. Potential-free alarm contacts allow remote monitoring of the cooler. The operating parameters are stored for diagnosis in a logfile. An operating hours counter monitors the service intervals and informs before it comes to an emergency shutdown. The operation of the condensate pumps can be adjusted to individual demands.

MAK10 sample gas coolers incorporate an advanced modular design. The housings are available as wall-mounting standard-housings, 19”-rack versions and mobile versions with handles.
MAK10 SAMPLES OF MODEL VERSIONS

**MAK 10P-1**

- 1 heat-exchanger PTFE/PVDF
- 1 gaspath (1x115/l/h)
- 1 condensate pump
- 1 MAK-alarmcontact

**MAK 10P-1 PS1-TF1-FM1-GP1**

- 1 heat-exchanger PTFE/PVDF
- 1 gaspath (1x125Nl/h)
- 1 pre-separator
- 2 condensate pumps
- 1 teflon depth filter
- 1 flowmeter
- 1 sample gas pump
- 1 MAK-alarmcontact
MAK10 SAMPLES OF MODEL VERSIONS

**MAK 10P-2 PS2-TF2-EC2**

- 1 heat-exchanger DUAL (PVDF)
- 2 gaspaths (2x70NI/h)
- 2 condensate pumps
- 2 teflon depth filters
- 2 electronic controls for ext. moisture sensors
- 1 MAK- / 2 sensor-alarmcontacts

**MAK 10P-2 PS2-TF1-MS1-EC1-FM1 19”-Rack Version**

- 1 heat-exchanger DUAL (PVDF)
- 2 gaspaths (2x85NI/h)
- 2 pre-separators
- 4 condensate pumps
- 1 teflon depth filter
- 1 moisture sensor with electronic control
- 1 flowmeter
- 1 MAK- / 1 sensor-alarmcontact
MAK10 INTEGRATED EQUIPMENT / OPTIONS

**Condensate pump**
- Reliable continuous condensate removal
- Slow speed, hose with long service life

**Condensate pre-separator**
- Separation of free condensate and solid particles
- Sample gas pre-cooling for inlet dew points >65°C

**Teflon depth filter**
- Reliable filtration of solid particles
- Quick and ease exchange of filtercartridge

**Flowmeter**
- Exact dosage, with fine adjustment needle-valve
- Optional light barrier

**Moisture sensor**
- Protection against condensate break-through
- Reliable detection of smallest amounts of liquid

**Electronic control**
- Control/alarm for moisture sensor or light barrier
- Potential-free directional contact

**Sample gas pump**
- Uncontaminated flow of sample gas
- Perfect integration into sample gas coolers
MAK10 HEAT-EXCHANGER SYSTEM

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

- Coldness transfer through aluminium
- Very good thermal conductance value 204 W/m°K
- Coldness transferred from all sides
- Extreme compact design
- Optimal shielding from the environment

High and constant dryness rate even at extreme load changes

- PTFE-coated, hydrophobic surface
- Immediate formation of large condensate droplets
- Spiral performing stream goes downwards
- Consistent use of gravity
- Discharge of condensate at the lowest point
- Aluminium core and block are cold storages

Exceptionally low gas dissolution rates enable accurate analysis

- Very small dead space
- Extreme short residence time of the gas
- Small heat-exchanger surface
- Rapid saturation of the surface
- Reduced response-time of gas to condensate
- On three sides evacuated condensate spiral stream
- Coating reduces electrostatics

Reliability and sustainability reduce time and efforts for maintenance

- Exchangeable heat-exchangers
- Optimal chemical resistance
- No abrasive wear-out
- Self-cleaning effects, no contamination
- Maintenance-free system
- Proven and safe technology
- Checked quality
- More than 10,000 systems in successful operation
# MAK10 TECHNICAL DATA

<table>
<thead>
<tr>
<th>Model</th>
<th>MAK10P-1</th>
<th>MAK10P-1 PS1</th>
<th>MAK10P-2</th>
<th>MAK10P-2 PS2</th>
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</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of gaspaths</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Number of condensate pumps</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Number of pre-separators</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Options</td>
<td>pre-separator, filter, flowmeter, moisture sensor, sample gas pump</td>
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</table>

### Material of gaspaths

<table>
<thead>
<tr>
<th>Function</th>
<th>MAK10P-1</th>
<th>MAK10P-1 PS1</th>
<th>MAK10P-2</th>
<th>MAK10P-2 PS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling transmission/storage rod</td>
<td>Aluminium-tube/block</td>
<td>Aluminium-block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling surface</td>
<td>PTFE-coating</td>
<td>PVDF (SS316 optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing / sealings</td>
<td>PVDF / Viton</td>
<td>PVDF (SS316 optional)</td>
<td></td>
<td></td>
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</tbody>
</table>

### Operation data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MAK10P-1</th>
<th>MAK10P-1 PS1</th>
<th>MAK10P-2</th>
<th>MAK10P-2 PS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas flow (^{1}) at 65°tp</td>
<td>1 x 110 Nl/h</td>
<td>1 x 125 Nl/h</td>
<td>2 x 70 Nl/h</td>
<td>2 x 85 Nl/h</td>
</tr>
<tr>
<td>Gas flow (^{1}) at 55°tp</td>
<td>1 x 150 Nl/h</td>
<td>1 x 170 Nl/h</td>
<td>2 x 90 Nl/h</td>
<td>2 x 110 Nl/h</td>
</tr>
<tr>
<td>Gas inlet temperature</td>
<td>max. 140°C (max. 180 °C for SS316 heat-exchangers)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>+5°C to +40°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas pressure</td>
<td>0.5-2.2 bar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas outlet temperature</td>
<td>3,0°C +/-0.3°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dead space per gas path</td>
<td>26 ml</td>
<td>55 ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ready for start up</td>
<td>&lt; 15 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling performance</td>
<td>peltier-elements with voltage modulation: 2 x 34,5 W</td>
<td></td>
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</tbody>
</table>

### Design data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MAK10P-1</th>
<th>MAK10P-1 PS1</th>
<th>MAK10P-2</th>
<th>MAK10P-2 PS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (WxHxD)</td>
<td>310x266x321</td>
<td>310x266x321</td>
<td>310x266x321</td>
<td>449x266x321</td>
</tr>
<tr>
<td>Weight without options</td>
<td>9.5 kg</td>
<td>10.0 kg</td>
<td>12.0 kg</td>
<td>15.0 kg</td>
</tr>
<tr>
<td>Housing</td>
<td>wall-mounting (19&quot;-rack and mobile optional) / RAL 7035</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Connections</td>
<td>gas: PVDF DN 4/6 / condensate: PVDF DN 4/6</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

### Electrical Daten

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MAK10P-1</th>
<th>MAK10P-1 PS1</th>
<th>MAK10P-2</th>
<th>MAK10P-2 PS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains connection</td>
<td>plug</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature monitoring</td>
<td>digital display, alarmcontacts, service monitoring, condensate pump control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm set-points</td>
<td>&lt; +2.0°C / &gt; +10.0°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection rate</td>
<td>IP 20 EN 60529 / EN 61010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conformity</td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>230V 50/60Hz or 115V 50/60Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>170-180 W</td>
<td></td>
<td></td>
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</tbody>
</table>

\(^{1}\) at standard conditions, dew point 65°C inlet temperature, 10-25°C ambient temperature

Subject to change without notice / Last update: 26.08.2015