ModbusRTU

Sample gas cooler TC-MIDI+

Many analysis processes require extracting sample gas from the process. This also extracts process-related contamination such as particles or moisture. These can impact the measurement results or damage the measuring cells. The sample gas must therefore be conditioned before entering the analyser. The sample gas cooler reduces the gas temperature to below the dew point for this purpose, causing moisture to drop out, which is then discharged as condensate.

In addition to the status output to monitor the sample gas cooler function, we offer an optional 4 – 20 mA analog output or digital interface. The process control can access the process and diagnostic data via the Modbus RTU interface as well as configure the device settings.

The TC-MIDI+ sample gas cooler is particularly a component in gas conditioning when the process or ambient conditions require a higher cooling capacity. It further features a new generation heat exchangers with particularly low washout of water-soluble components and particularly suitable for measuring emissions. Most notably, the washout of SO_2 is low. The TC-MIDI+ sample gas coolers can therefore be used for so-called automated measuring systems (AMS) as per EN 15267-3.

- Compact design: Pre-installed and ready to connect
- Low maintenance costs based on easy accessibility
- Duran glass or PVDF heat exchanger
- Adjustable outlet dew point and alarm thresholds
- Nominal cooling capacity 195 kJ/h (40 °C version) or 175 kJ/h (50 °C version)
- Dew point stability 0.1 °C
- Status display and output
- Cooling block temperature display
- Optional 4 - 20 mA or Modbus RTU signal output
- Optional CE mark or FM approval
- Moisture detector, filter, condensate pump and sample gas pump optional

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Overview

The TC-MIDI+ series was designed specifically for the requirements in so-called automated measuring systems (AMS) according to EN 15267-3. The series connection of the heat exchangers will cool in two cycles to minimise wash out effects.

The Peltier coolers are distinguished by two types according to cooling capacity or operation temperature. This classification is reflected in the type designation. The exact item number of the model defined by you is determined by the model code in the category ordering information.

Application	Standard applications	
Operating temperature	40 °C	50 °C
2 heat exchangers in series	TC-MIDI+ 6121	TC-MIDI+ 6122

Additional components which every conditioning system should feature can optionally be integrated:

- Peristaltic pump for condensate separation,
- Filter,
- Moisture detector,
- sample gas pump.

In addition, we offer different signal outputs:

- Status output
- Analog output, 4...20 mA, incl. status output,
- Modbus RTU digital output, incl. status output

This allows for various configurations of cooler and options. Here the approach is to simplify creating a complete system in a cost-efficient way through pre-installed components with hoses connected. We further paid attention to easy access to wear parts and consumables.

Description of functions

The cooler is controlled by a microprocessor. With the factory preset the control already incorporates the various characteristics of the built-in heat exchangers.

The programmable display shows the block temperature in the selected display unit (°C / °F) (factory preset °C). Application-specific settings can easily be configured guided by the menu, using the 5 buttons. For one, this applies to the target outlet dew point, which can be set from 2 to 20 °C (36 °F to 68 °F) (factory preset 5 °C/41 °F).

And then the warning thresholds can be adjusted for low and excess temperature. These are set relative to the outlet dew point τ_a setting.

For the low temperature the range is τ_a -1 to - 3 K (at a minimum 1 °C/ 34 °F cooling block temperature), for the excess temperature the range is τ_a +1 to +7 K. The factory presets for both values are 3 K.

The flashing display and the status relays indicate the conditions are below or above the configured warning range (e.g. after switching on).

The status output can e.g. be used to control the sample gas pump to allow for the gas flow to only be switched on once the permissible cooling range has been reached or shut off the pump in the event of a moisture detector alarm.

The separated condensate can be drained via connected peristaltic pumps or add-on automatic condensate drains.

Fine mesh filters can also be used, which in turn can be installed in optional moisture detectors.

The glass dome allows the dirt level of the filter element to easily be determined.

The moisture detector is easy to remove. This may be required if a condensate enters the cooler due to a malfunction and the peristaltic pump or the automatic condensate drain is unable to remove it.

A P1 gas pump can be attached to the gas cooler, optionally also with bypass valve for regulating the flow. This allows the sample gas pump to be expanded by a single-leg system, so when equipped with a single heat exchanger or for the respective application the two gas paths of the dual heat exchangers are switched in series, for example Cooling 1 – Pump – Cooling 2.

Gas cooler technical data

Gas Cooler Technical Data				
Ready for operation	after max. 10 minutes			
Ambient temperature	5 °C to 60 °C			
Gas outlet dew point preset: adjustable:	 5 °C 2 °C...20 °C			
IP rating	IP 20			
Mechanical load	Tested based on DNV-GL CG0339 vibration class A (0.7g) [1] 2 Hz-13.2 Hz amplitude ± 1.0 mm 13.2 Hz -100 Hz acceleration			
Housing	Stainless steel, brushed			
Packaging dimensions	approx. 350 x 220 x 220 mm			
Weight incl. heat exchanger	approx. 12 kg approx. 15.5 kg at full expansion stage			
Electrical data	Unit without add-on		Unit with add-on (P1.x + peristaltic pump)	
	230 V AC	**115 V AC**	**230 V AC**	**115 V AC**
	+5/-10%	+5/-10%	+-5%	+-5%
	50/60 Hz	50/60 Hz	50 Hz	60 Hz
	1.2 A	2.4 A	1.8 A	3.6 A
	200 W / 280 VA		290 W / 420 VA	
Recommended fuse (characteristic: delayed action)	3.15 A	6.3 A	3.15 A	6.3 A
Status output switching capacity	max. 250 V AC, 150 V DC 2 A, 50 VA, potential-free			
Electrical Connections	Plug per EN 175301-803			
Gas connections and condensate outlet	Heat exchanger see table "Heat Exchanger Overview" Filter, moisture detector adapter G1/4 or NPT 1/4"			
Parts in contact with media Filter: Moisture detector: Heat exchanger: Peristaltic pump: Sample gas pump: Tubing:	 see "Technical Data - Options" see "Technical Data - Options" see table "Heat Exchanger Overview" see "Technical Data - Options" see "Technical Data - Options" PTFE/Viton			
FM no.:	3062014			

[1] not in conjunction with add-on sample gas pump

Technical Data - Options

Analogue Output Cooler Temperature Technical Data

Signal	4-20 mA or 2-10 V corresponds to -20 °C to +60 °C cooler temperature
Connection	M12x1 plug, DIN EN 61076-2-101

Digital interface technical data

Signal	Modbus RTU (RS-485)
Connection	M12x1 connector, DIN EN 61076-2-101

Technical Data Peristaltic Pumps CPdouble

Flow rate	0,3 l/h (50 Hz) / 0,36 l/h (60 Hz) with standard hose
Vacuum inlet	max. 0,8 bar
Pressure inlet	max. 1 bar
Outlet pressure	1 bar
Hose	4 x 1,6 mm
Condensate outlet	Hose nipple Ø6 mm Screw connection 4/6 (metric), 1/6“-1/4“ (US)
Protection class	IP 40
Materials Hose: Connections:	 Norprene (Standard), Marprene, Fluran PVDF

Technical Data Sample Gas Pump P1

Ambient temperature	0 °C to 50 °C
Operating pressure	max. 1,3 bar abs.
Nominal outlet	280 l/h (at p = 1 bar abs.)
Materials in contact with media vary by configuration	PTFE, PVDF, 1.4571, 1.4401, Viton, PFA

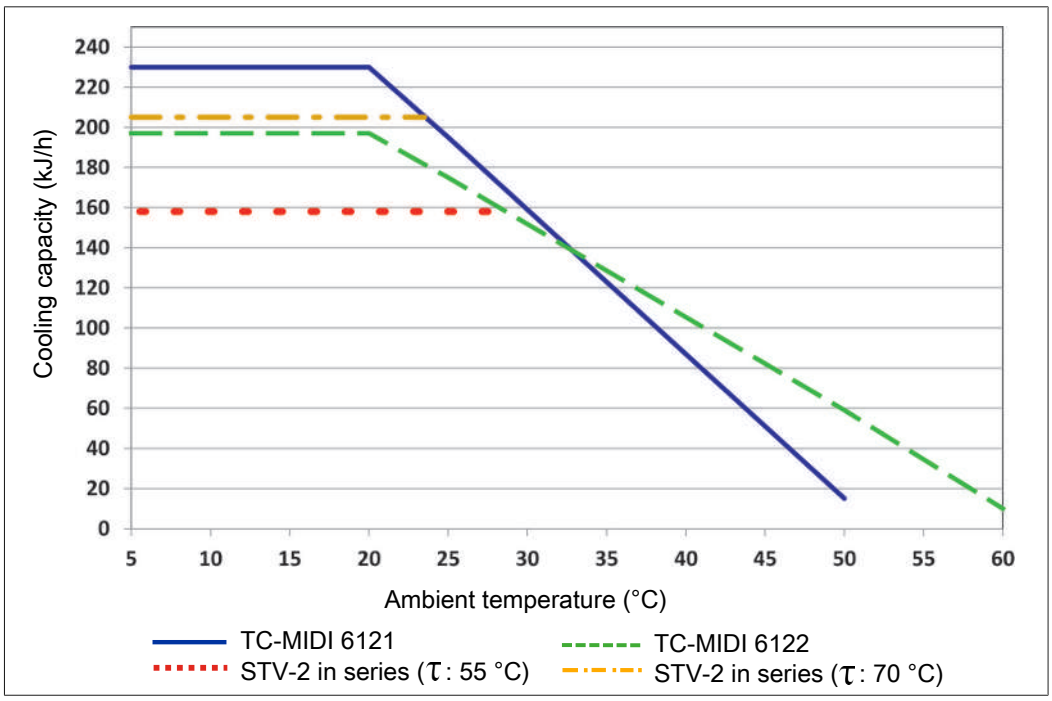
Technical Data Filter AGF-PV-30-F2-L

Ambient temperature	3 °C to 100 °C
max. operating pressure with filter	4 bar
Filter surface	125 cm^2
Filter fineness	2 µm
Dead volume	108 ml
Materials Filter: Seal: Filter element:	 PVDF, Duran glass (parts in contact with mediums) Viton sintered PTFE

Technical Data FF-3-N Moisture Detector

Ambient temperature	3 °C to 50 °C
max. operating pressure with FF-3-N	2 bar
Material	PVDF, PTFE, epoxy resin, stainless steel 1.4571, 1.4576

Performance Data



Note: The capacity of STG-2 heat exchanges is equivalent to the maximum cooling capacity of the cooler.

Heat exchanger description

The energy content of the sample gas and the required cooling capacity of the gas cooler is determined by three parameters: gas temperature ϑ_G, dew point τ_e (moisture content) and volume flow v. The outlet dew point rises with increasing energy content of the gas. The approved energy load from the gas is therefore determined by the tolerated rise in the dew point.

The following limits are specified for a standard operating point of τ_e = 50 °C and ϑ_G = 70 °C. The maximum volume flow v_{max} in Nl/h of cooled air is indicated, so after moisture has condensed.

If the values fall below τ_e and ϑ_G, the flow v_{max} may be increased. For example, on the STG-2 heat exchanger the parameter triple τ_e = 40 °C, ϑ_G = 70 °C and v = 575 Nl/h may also be used in place of τ_e = 50 °C, ϑ_G = 70 °C and v = 320 Nl/h.

Please contact our experts for clarification or refer to our design program.

Heat exchanger overview

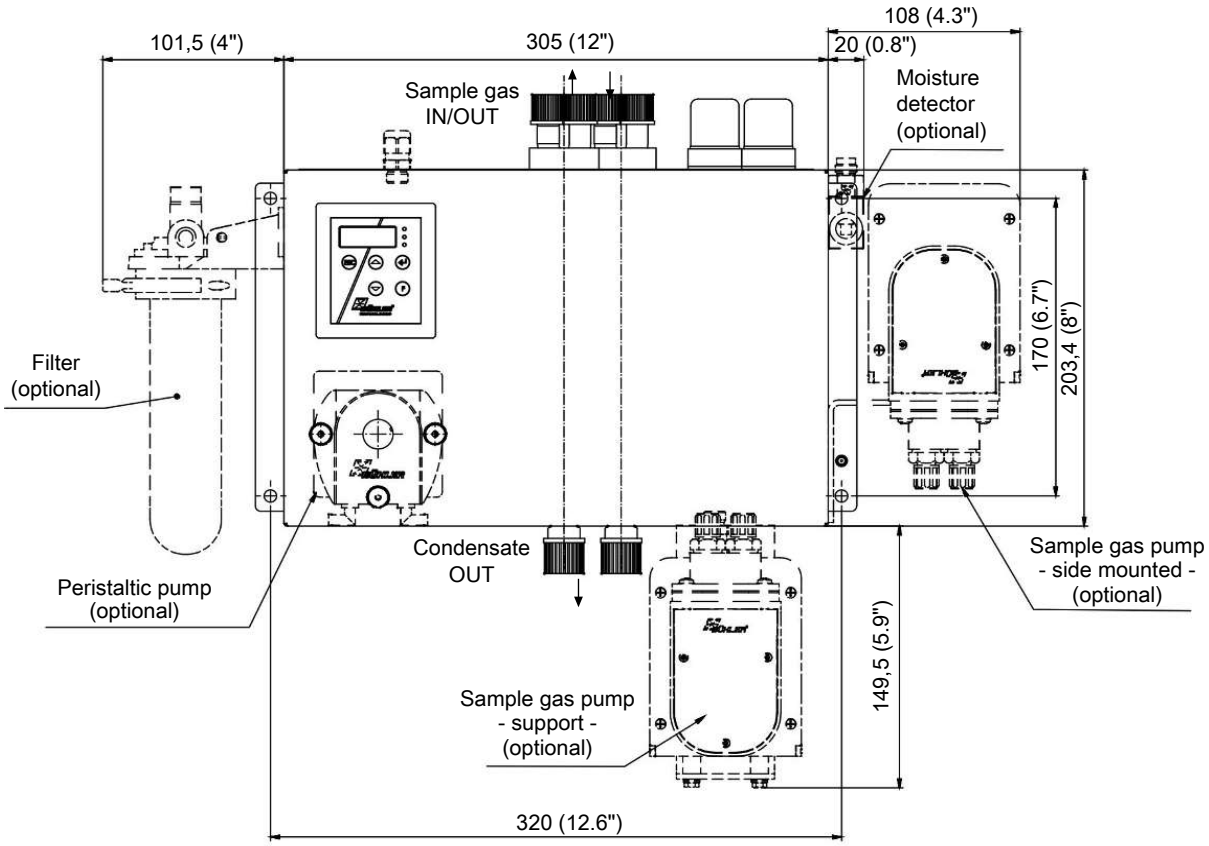
Heat exchanger	2x STG-2 2x STG-2-I [2]	2x STV-2 2x STV-2-I [2]
Materials in contact with media	Glass PTFE	PVDF
Flow rate v_{max} [1]	320 L/h	300 L/h
Inlet dew point $\tau_{e,max}$ [1]	70 °C	70 °C
Gas inlet temperature $\vartheta_{G,max}$ [1]	140 °C	140 °C
Gas pressure p_{max}	3 bar	3 bar
Pressure drop Δp (v=150 L/h)	2.6 mbar	2.9 mbar
Max. Cooling capacity Q_{max}	345 kJ/h	210 kJ/h
Dead volume V_{tot}	47 ml	41 ml
Gas connections (metric)	GL 14 (6 mm) [3]	DN 4/6
Gas connections (US)	GL 14 (1/4") [3]	1/4"-1/6"
Condensate out connection (metric)	GL 18 (10 mm) [3]	G1/4
Condensate out connection (US)	GL18 (10 mm) [3]	NPT 1/4"

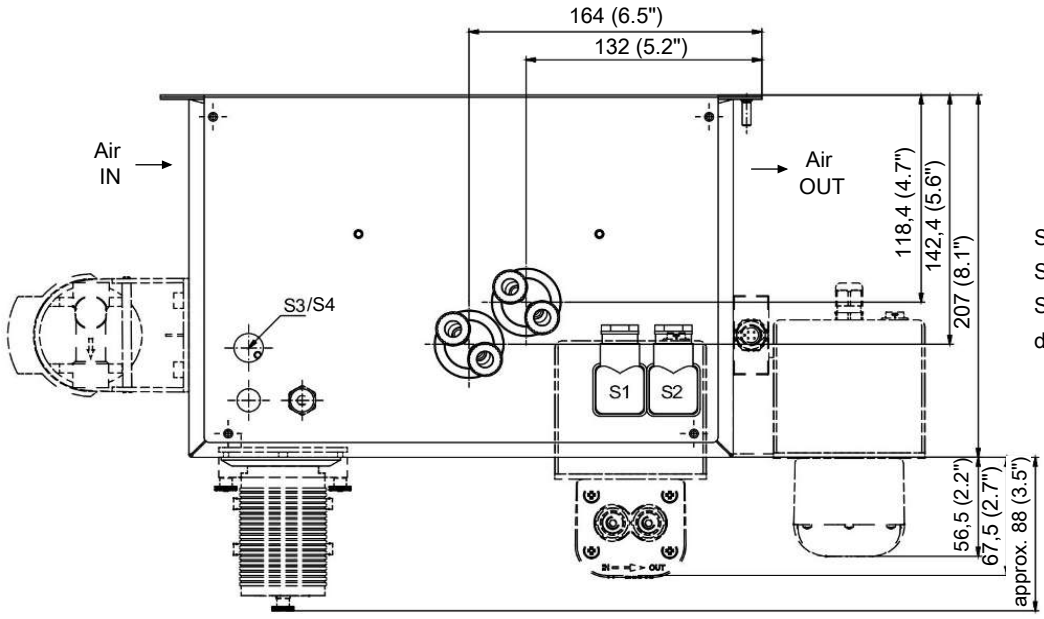
[1] Max. cooling capacity of the cooler must be considered.

[2] Models marked I have NPT threads or US tubes, respectively.

[3] Gasket inside diameter

Dimensions (mm)





S1 = Electric supply
S2 = Status output
S3/S4 = Analog/
digital output (optional)

Ordering instructions

Gas cooler model with two heat exchangers in series

The item number is a code for the configuration of your unit. Please use the following model code:

4496	3	1	2	X	X	X	1	X	X	X	X	X	X	0	0	0	0	Product Characteristics
																		Gas cooler models
				1														TC-MIDI+ 6121: Ambient temperature 40 °C
				2														TC-MIDI+ 6122: Ambient temperature 60 °C
																		Certifications
					0													Standard applications – CE
					1													for common locations - FM
																		Supply voltage
						1												115 V AC, 50/60 Hz
						2												230 V AC, 50/60 Hz
																		Heat exchanger
							1	2	2									Duran glass, STG-2, metric
							1	2	7									Duran glass, STG-2-I, US
							1	3	2									PVDF, STV-2, metric [1]
							1	3	7									PVDF, STV-2-I, US [1]
																		Condensate drain [4]
										0								without condensate drain
										2								CPdouble with hose nipple, angled
										4								CPdouble with screw connection [6]
																		Sample gas pumps [3]
											0							without sample gas pump
											1							P1, 1 gas path, PVDF, bottom mounted
											2							P1, 1 gas path, with bypass valve, bottom mounted
											6							P1, 1 gas path, PVDF, mounted externally [2]
											7							P1, 1 gas path, with bypass valve, side mounted [2]
																		Moisture detector [4] **/ Filter**
												0	0					without filter, without moisture detector
												0	1					without filter, 1 moisture detector with PVDF adapter [5]
												1	0					1 filter, without moisture detector
												1	1					1 filter with built-in moisture detector
																		Signal outputs
														0	0			status output only
														1	0			Analog output, 4...20 mA incl. status output
														2	0			Modbus RTU digital output incl. status output [7]

[1] Condensate outlets only suitable when connecting peristaltic pumps.

[2] External sample gas pump P1 only allows 1 filter.

[3] Factory installed tubing for suction operation.

[4] With this option, the maximum ambient temperature is limited to 50 °C.

[5] Also available in stainless steel.

[6] Metric or US connection, per heat exchanger.

[7] Option only available for CE version.

Consumables and accessories

Item no.	Description
4510008	Automatic condensate drain AK 5.2 (pressure operation only)
4510028	Automatic condensate drain AK 5.5 (pressure operation only)
4410004	Automatic condensate drain AK 20 (pressure operation only)
4410001	Automatic condensate drain 11 LD V 38 (pressure operation only)
9144050038	Cable for cooler temperature analog output 4 m
41020050	Filter element F2-L; 2-pack
4410005	Condensate trap GL1, 0.4 L
44920035012	Condensate pump replacement hose, Tygon (Norprene), angled hose nipple
44920035016	Condensate pump replacement hose, Tygon (Norprene), angled hose nipple and screw connection (metric)
44920035017	Condensate pump replacement hose, Tygon (Norprene), angled hose nipple and screw connection (US)
4228003	Bellow for P1 pump
9009398	O-ring for bypass P1 pump
4228066	Set inlet/outlet valves 70 °C for P1 pump
see data sheet 420011	Sample Gas Pumps P1
see data sheet 450020	CPsingle, CPdouble peristaltic condensate pumps