



## Gas cooler series TC-MIDI+ X2

In the chemical industry, petrochemistry or biochemistry, reliable process control relies on prompt and exact determination of the operating parameters.

Here, gas analysis is the key for safe and efficient control of process flows, environmental protection and quality assurance. This benefits controlling flue gas emission in power stations or exhaust gas analysis in automotive engineering, as well as the efficient control of air separators or sterile production and packaging in the food industry.

Many of the analysis processes used in these fields require extracting the sample gas. This inevitably also extracts process-related contamination such as particles or moisture. These in turn can impact the measurement results or damage the measuring cells. The sample gas must therefore be conditioned before entering the analyser.

Many applications require equipment which can be used in explosive areas. This is where the TC-MIDI+ X2 series provides solutions for Zone 2 or Class I, Division 2.

ATEX and IECEx Zone 2 approval

FM C-US approval for Class I, Division 2

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

Low operating noise

Rated capacity 185/166 Btu/h, 104 °F/122 °F version

Dew point stability 0.2 °F

Status display and output

Cooling block temperature display

Moisture detector, filter, analog output, peristaltic pump, and sample gas pump optional



## Overview

The TC-MIDI+ X2 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 according to cooling capacity/operating 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	104 °F	122 °F
2 heat exchangers in series	TC-MIDI+ 6121 X2	TC-MIDI+ 6122 X2

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

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

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  $\tau_a$  setting.

For the low temperature the range is  $\tau_a - 1$  to  $- 3$  K (at a minimum 1 °C/ 34 °F cooling block temperature), for the excess temperature the range is  $\tau_a + 1$  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.

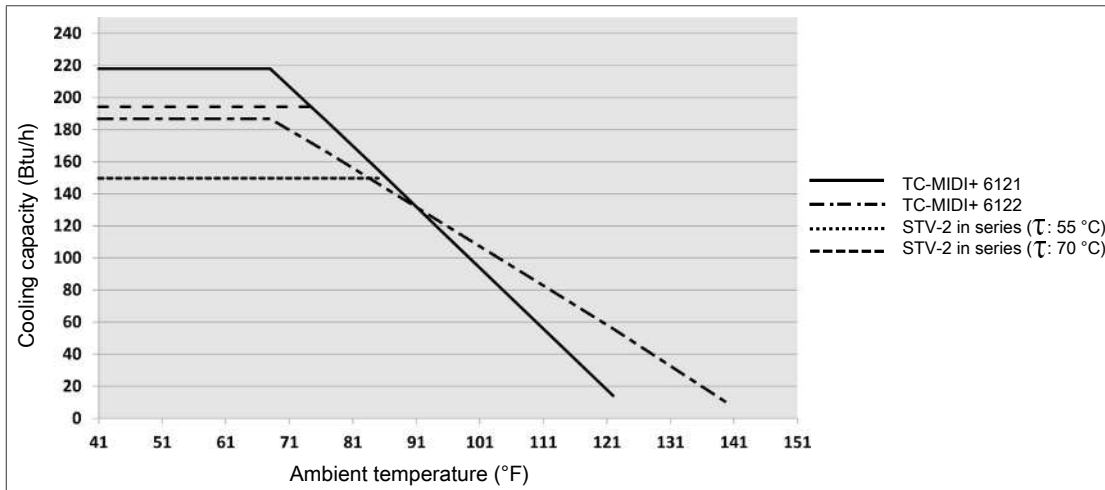
Fine mesh filters can also be used, which in turn can be installed in optional moisture detectors.

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.

Performance curves



Note: The limit curves for the heat exchangers exchanger apply to a dew point of 122 °F.

Gas cooler technical data

Gas Cooler Technical Data

Ready for operation	after max. 10 minutes			
Ambient temperature	41 °F to 140 °F			
Gas output dew temperature preset:	41 °F			
adjustable:	36 °F...68 °F			
IP rating	IP 20			
Mechanical load	Tested based on DNV-GL CG0339 vibration class A (0.7g) <sup>1)</sup> 2 Hz-13.2 Hz amplitude ± 1.0 mm 13.2 Hz -100 Hz acceleration			
Housing	Stainless steel, brushed			
Packaging dimensions	approx. 13.8 x 8.7 x 8.7 in			
Weight incl. heat exchanger	approx. 13.8 lb approx. 32 lb at full expansion stage			
Electrical data	Unit without add-on		Unit with add-on (P1.x + peristaltic pump)	
	<b>230 V AC</b>	<b>115 V AC</b>	<b>230 V AC</b>	<b>115 V AC</b>
	+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:	see "Technical Data - Options"			
Moisture detector:	see "Technical Data - Options"			
Heat exchanger:	see table "Heat Exchanger Overview"			
Peristaltic pump:	see "Technical Data - Options"			
Sample gas pump:	see "Technical Data - Options"			
Tubing:	PTFE/Viton			
Markings:	FM18ATEX0012X: II 3 G Ex ec nC IIC T4 Gc IECEx FMG 18.0005X: Ex ec nC IIC T4 Gc FM18US0021X/FM18CA0010X: CL I DIV 2 GP ABCD RU C-DE.HA65.B.00608/20			

<sup>1)</sup> 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 -4 °F to 140 °F cooler temperature
Connection	M12x1 plug, DIN EN 61076-2-101

### Technical Data Peristaltic Pumps CPdouble X2

Flow rate	0.3 L/h (50 Hz) / 0.36 L/h (60 Hz) with standard hose
Vacuum inlet	max. 11.60 psi
Pressure inlet	max. 14.50 psi
Output pressure	14.50 psi
Hose	0.16 x 0.06 in
Condensate outlet	Hose nipple Ø0.24 in Screw connection 4/6 (metric), 1/6"-1/4" (US)
IP rating	IP 40
Materials	
Hose:	Norprene (standard), Marprene, Fluran
Connections:	PVDF

### Technical Data Sample Gas Pump P1.3

Ambient temperature	32 °F to 122 °F
Operating pressure	max. 18.8 psi abs.
Nominal outlet	4.6 lpm (at p = 14.5 psi abs.)
Materials in contact with media vary by configuration	PTFE, PVDF, 1.4571, 1.4401, Viton

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

Ambient temperature	37 °F to 212 °F
max. operating pressure with filter	29 psi
Filter surface	19.4 in <sup>2</sup>
Filter mesh	2 µm
Dead volume	6.59 cu. in.
Materials	
Filter:	PVDF, Duran glass (parts in contact with media)
Seal:	Viton
Filter element:	sintered PTFE

### Technical Data FF-3-N Moisture Detector

Ambient temperature	37 °F to 122 °F
max. operating pressure with FF-3-N	29 psi
Material	PVDF, PTFE, epoxy resin, stainless steel 1.4571, 1.4576

## 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  $\vartheta_G$ , dew point  $\tau_e$  (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  $\tau_e = 122$  °F and  $\vartheta_G = 158$  °F. The maximum volume flow  $v_{\max}$  in lpm of cooled air is indicated, so after moisture has condensed.

If the values fall below  $\tau_e$  and  $\vartheta_G$ , the flow  $v_{\max}$  may be increased. For example, on the STG-2 heat exchanger the parameter triple  $\tau_e = 104$  °F,  $\vartheta_G = 158$  °F and  $v = 9.6$  lpm may also be used in place of  $\tau_e = 122$  °F,  $\vartheta_G = 158$  °F and  $v = 5.3$  lpm.

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

## Heat exchanger overview

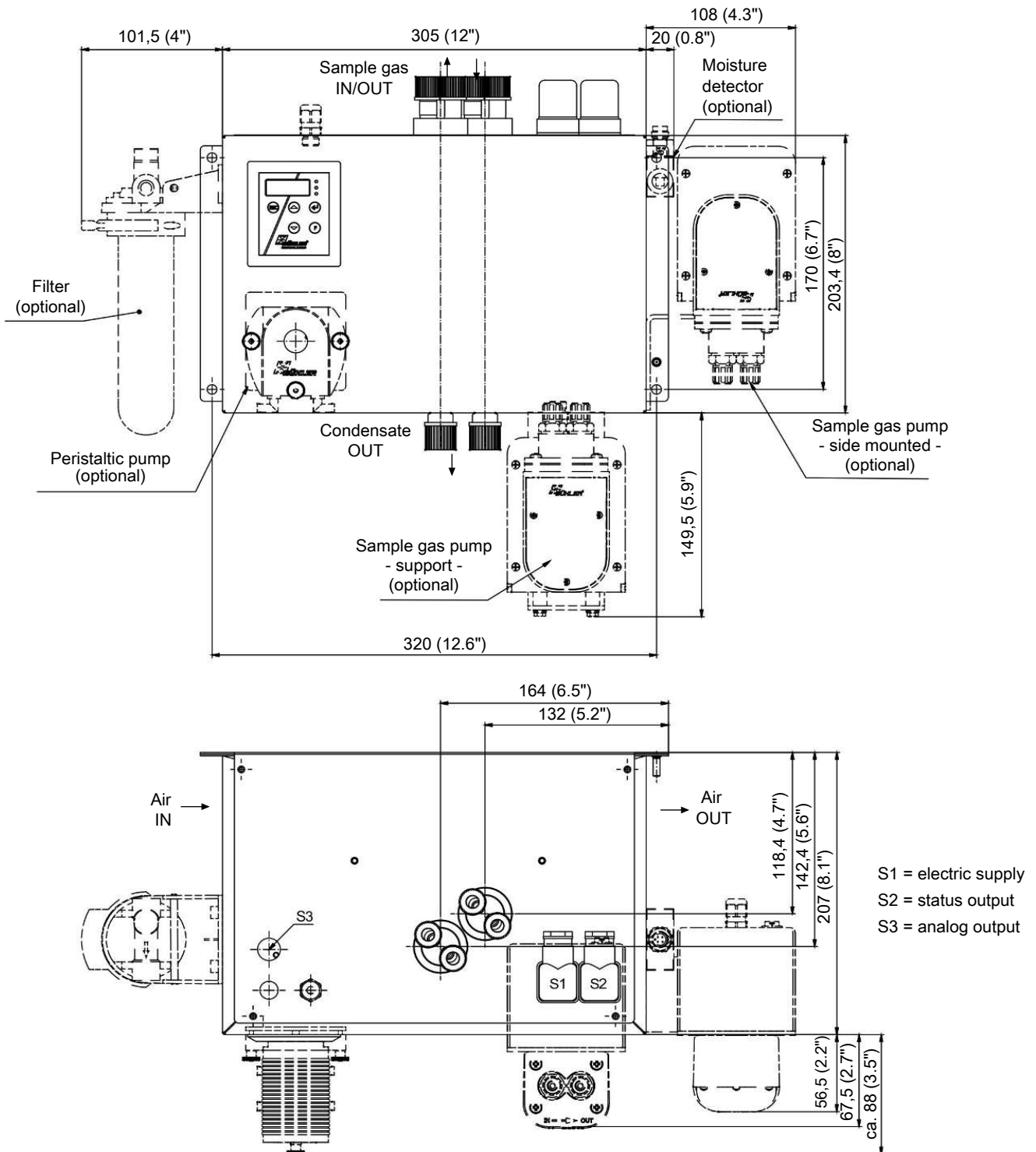
Heat exchanger	2x STG-2 2x STG-2-I <sup>2)</sup>	2x STV-2 2x STV-2-I <sup>2)</sup>
Version/Material	Glass	PVDF
Flow rate $v_{\max}$ <sup>1)</sup>	5.3 lpm	5 lpm
Inlet dew point $\tau_{e,\max}$ <sup>1)</sup>	158 °F	158 °F
Gas inlet temperature $\vartheta_{G,\max}$ <sup>1)</sup>	284 °F	284 °F
Gas pressure $p_{\max}$	44 psi	44 psi
Pressure drop $\Delta p$ ( $v=150$ L/h)	0.04 psi	0.04 psi
Max. Cooling capacity $Q_{\max}$	327 Btu/h	199 Btu/h
Dead volume $V_{\text{tot}}$	2.9 cu.in.	2.5 cu.in.
Gas connections (metric)	GL 14 (6 mm) <sup>3)</sup>	DN 4/6
Gas connections (US)	GL 14 (1/4") <sup>3)</sup>	1/4"-1/6"
Condensate out connection (metric)	GL 18 (10 mm) <sup>3)</sup>	G1/4
Condensate out connection (US)	GL18 (10 mm) <sup>3)</sup>	NPT 1/4"

<sup>1)</sup> Max. cooling capacity of the cooler must be considered.

<sup>2)</sup> Models marked I have NPT threads or US tubes, respectively.

<sup>3)</sup> Gasket inside diameter

Dimensions (inch)



Ordering instructions

Gas cooler models 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	2	X	1	X	X	X	X	X	X	X	0	0	0	Product Characteristics
<b>Gas cooler types</b>																		
1 TC-MIDI+ 6121 X2: Ambient temperature 104 °F																		
2 TC-MIDI+ 6122 X2: Ambient temperature 140 °F																		
<b>Certifications</b>																		
2 for explosive areas																		
<b>Supply voltage</b>																		
1 115 V AC, 50/60 Hz																		
2 230 V AC, 50/60 Hz																		
<b>Heat exchanger</b>																		
1 2 2 Duran glass, STG-2, metric																		
1 2 7 Duran glass, STG-2-I, US																		
1 3 2 PVDF, STV-2, metric <sup>1)</sup>																		
1 3 7 PVDF, STV-2-I, US <sup>1)</sup>																		
<b>Peristaltic Pumps <sup>4)</sup></b>																		
0 without peristaltic pump																		
2 CPdouble X2 with hose nipple, angled																		
4 CPdouble X2 with screw connection, metric/US																		
<b>Sample Gas Pumps <sup>3)</sup></b>																		
0 without sample gas pump																		
1 P1.3, 1 gas path, PVDF, bottom mounted																		
2 P1.3, 1 gas path, with bypass valve, bottom mounted																		
6 P1.3, 1 gas path, PVDF, mounted externally <sup>2)</sup>																		
7 P1.3, 1 gas path, with bypass valve, mounted externally <sup>2)</sup>																		
<b>Moisture detector <sup>4)</sup> / filter</b>																		
0 0 without filter, without moisture detector																		
0 1 without filter, 1 moisture detector with PVDF adapter <sup>5)</sup>																		
1 0 1 filter, without moisture detector																		
1 1 1 filter with built-in moisture detector																		
<b>Signal outputs</b>																		
0 0 status output only																		
1 0 Analog output, 4...20 mA additional																		

<sup>1)</sup> Condensate outlets only suitable when connecting peristaltic pumps.

<sup>2)</sup> External sample gas pump P1.3 only allows 1 filter.

<sup>3)</sup> Factory installed tubing for suction operation.

<sup>4)</sup> With this option, the maximum ambient temperature is limited to 122 °F.

<sup>5)</sup> Also available in stainless steel.

## Consumables and accessories

Item no.	Description
45 10 008	Automatic condensate drain AK 5.2
45 10 028	Automatic condensate drain AK 5.5
44 10 004	Automatic condensate drain AK 20
44 10 001	Automatic condensate drain 11 LD V 38
41 02 00 50	Replacement filter element F2-L; Unit 2 count
91 44 05 00 38	Cable for cooler temperature analog output 4 m (13 ft.)
44 10 00 5	Condensate trap GL1, 0.4 L
44 92 00 35 012	Norprene replacement hose with angled connections for peristaltic pump 0.005 lpm
44 92 00 35 016	Norprene replacement hose with one angled connection and one screw connection (metric) for peristaltic pump 0.005 lpm
44 92 00 35 017	Norprene replacement hose with one angled connection and one screw connection (US) for peristaltic pump 0.005 lpm
42 28 00 3	Bellow for P1 pump
90 09 39 8	O-ring for bypass P1 pump
42 28 06 6	Set inlet/outlet valves 158 °F for P1 pump