



ModbusRTU

## Sample gas cooler TC-Standard+

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 Standard+ series features a new generation heat exchangers with a particularly low wash out effect of water-soluble components and are specifically suitable for measuring emissions. Particularly the wash out effect of SO<sub>2</sub> is low. These coolers can therefore be used for so-called automated measuring systems (AMS) per EN 15267-3.

Low washout effects

Compact design: Pre-installed and ready to connect

Low maintenance costs based on easy accessibility

Optimised heat exchanger type 2 in Duran glass or PVDF

Adjustable outlet dew point and alarm thresholds

Nominal cooling capacity 95 Btu/h (104 °F version) or 85 Btu/h (122 °F version)

Dew point stability 0.2 °F

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 and condensate pump optional



## Overview

The TC-Standard+ 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-Standard+ 6121	TC-Standard+ 6122

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

- Peristaltic pump for condensate separation,
- Filter,
- Moisture detector

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  $\tau_a$  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.

**Gas cooler technical data**

<b>Gas Cooler Technical Data</b>						
Ready for operation	after max. 10 minutes					
Ambient temperature	41 °F to 122 °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) 2 Hz-13.2 Hz amplitude ± 1.0 mm 13.2 Hz -100 Hz acceleration					
Housing	Stainless steel, brushed					
Packaging dimensions	approx. 14 x 8.7 x 8.1 in					
Weight incl. heat exchanger	approx. 16.5 lb approx. 13.2 lb (for 24 V DC) approx. 19.8 lb at full expansion stage					
Electrical data	Unit without add-on			Unit with add-on (1 peristaltic pump)		
	<b>24 V DC</b>	<b>230 V AC</b>	<b>115 V AC</b>	<b>24 V DC</b>	<b>230 V AC</b>	<b>115 V AC</b>
	±10%	+5/-10%	+5/-10%	±10%	+5/-10%	+5/-10%
	-	50/60 Hz	50/60 Hz	-	50/60 Hz	50/60 Hz
	5 A	0.6 A	1.2 A	5.5 A	0.7 A	1.4 A
	120 W	110 W / 140 VA		130 W	130 W / 160 VA	
Recommended fuse (characteristic: delayed action)	6.3 A	1.25 A	2.5 A	6.3 A	1.25 A	2.5 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"					
Tubing:	PTFE/Viton					
FM no.:	3062014					

## 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

## Digital interface technical data

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

## 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

## CPdouble Peristaltic Pump Technical Data

Ambient temperature	32 °F to 131 °F
Flow rate	0.005 lpm (50 Hz) / 0.006 lpm (60 Hz) with standard hose
Vacuum inlet	max. 11.6 psi
Pressure inlet	max. 14.5 psi
Outlet pressure	14.5 psi
Hose	4 x 1.6 mm (0.04 in)
Degree of protection	IP 44
Materials	
Hose:	Norprene (standard), Marprene, Fluran
Connections:	PVDF

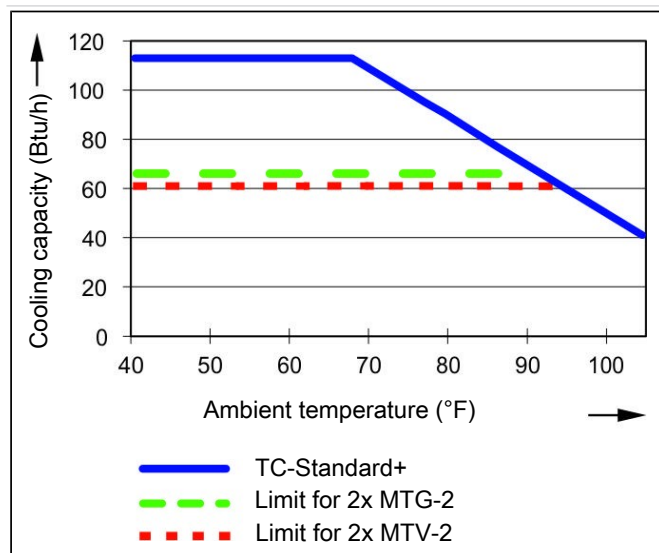
## AGF-PV-30-F2 Filter Technical Data

Ambient temperature	37 °F to 212 °F
max. operating pressure with filter	58 psi
Filter surface	9.3 in <sup>2</sup>
Filter fineness	2 µm
Dead volume	3.47 cu. in.
Materials	
Filter:	PVDF, Duran glass (parts in contact with media)
Seal:	Viton
Filter element:	sintered PTFE

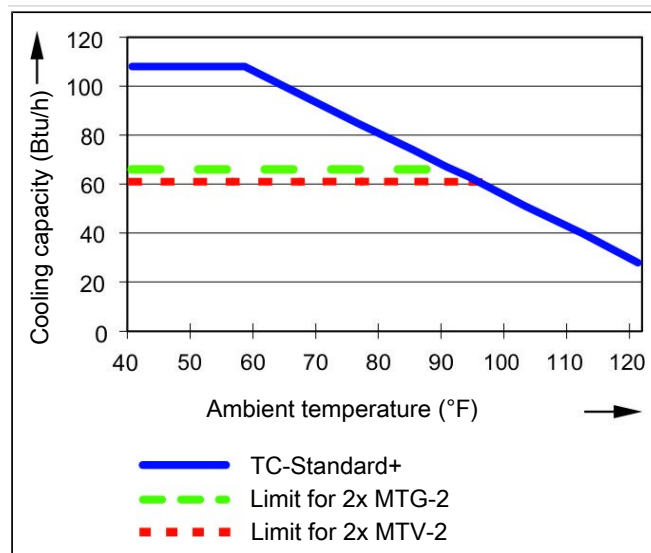
## Output

**Model TC-Standard+ 6121**

Rated cooling capacity (at 77 °F)	95 Btu/h
Max. Ambient temperature	104 °F
Dew point fluctuations static	± 0.1 K
in the entire specification range	± 1.5 K
Temperature difference between heat exchangers	< 0.5 K


**Model TC-Standard+ 6122**

Rated cooling capacity (at 77 °F)	85 Btu/h
Max. Ambient temperature	122 °F
Dew point fluctuations static	± 0.1 K
in the entire specification range	± 1.5 K
Temperature difference between heat exchangers	< 0.5 K



Note: The limit curves for the heat exchangers MTV-2 and MTG-2 apply to a dew point of 122 °F.

## 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 following limits for the maximum flow are specified for a standard operating point of  $T_e = 104$  °F and  $\vartheta_g = 158$  °F. The maximum flow  $v_{max}$  in NI/h of cooled air indicated, so after moisture has condensed. Values may differ for other dew points and gas inlet temperatures. However, the physical facts are so vast we decided to omit the illustration. Please contact our experts for clarification or refer to our calculation program.

## Heat exchanger overview

Heat exchanger	2x MTG-2 <sup>3)</sup> 2x MTG-2-I <sup>2) 3)</sup>	2x MTV-2 <sup>3)</sup> 2x MTV-2-I <sup>2) 3)</sup>
Materials in contact with media	Glass PTFE	PVDF
Flow rate $v_{\max}$ <sup>1)</sup>	3.5 lpm	3.2 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
Max. Cooling capacity $Q_{\max}$	76 Btu/h	62 Btu/h
Gas pressure $p_{\max}$	44 psi	29 psi
Pressure drop $\Delta p$ ( $v=2.5$ lpm)	0.28 psi	0.26 psi
Dead volume $V_{\text{tot}}$	2.3 cu. in.	2.1 cu. in.
Gas connections (metric)	GL14 (6 mm) <sup>4)</sup>	DN 4/6
Gas connections (US)	GL14 (1/4") <sup>4)</sup>	1/4"-1/6"
Condensate out connection (metric)	GL18 (8 mm) <sup>4)</sup>	G1/4
Condensate out connection (US)	GL18 (8 mm) <sup>4)</sup>	NPT 1/4"

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

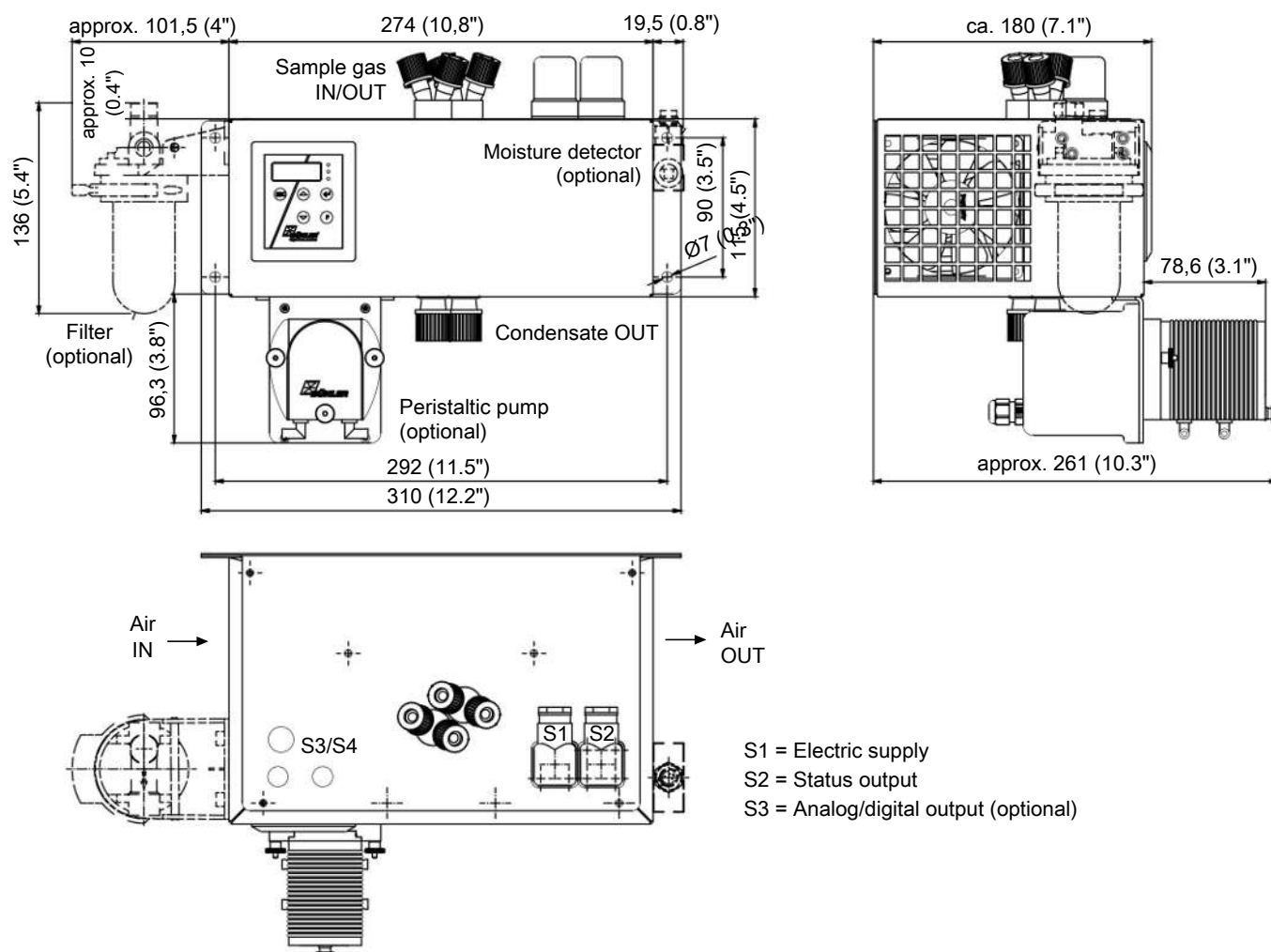
<sup>2)</sup> Models marked I have NPT threads or US tubes, respectively.

<sup>3)</sup> Passive discharge via automatic condensate drains or traps not applicable for MTG-2 heat exchangers. For passive discharge on MTV-2 heat exchangers, use a screw connection with a clearance of at least 7 mm (9/32") (see accessories).

<sup>4)</sup> Gasket inside diameter.

## Dimensions (inch)

Models for standard applications (TC-Standard 612x):



## 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	2	1	2	X	X	X	1	X	X	X	0	X	X	X	0	0	0	0	Product Characteristics
<b>Gas cooler models (with 2 in-line heat exchangers)</b>																			
1				TC-Standard+ 6121: Ambient temperature 104 °F															
2				TC-Standard+ 6122: Ambient temperature 122 °F															
<b>Certifications</b>																			
0				Standard applications – CE															
1				for common locations - FM															
<b>Supply voltage</b>																			
1				115 V AC, 50/60 Hz															
2				230 V AC, 50/60 Hz															
4				24 V DC															
<b>Heat exchanger</b>																			
1 2 2				Duran glass, 2x MTG-2, metric															
1 2 7				Duran glass, 2x MTG-2-I, US															
1 3 2				PVDF, 2x MTV-2, metric															
1 3 7				PVDF, 2x MTV-2-I, US															
<b>Condensate drain <sup>1)</sup></b>																			
0 0				without condensate drain															
2 0				CPdouble with hose nipple, angled															
4 0				CPdouble with screw connection <sup>3)</sup>															
<b>Moisture detector/filter</b>																			
0 0				without filter, without moisture detector															
0 1				without filter, 1 moisture detector with PVDF adapter <sup>2)</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 incl. status output															
2 0				Modbus RTU digital output incl. status output <sup>4)</sup>															

<sup>1)</sup> 24 V DC CPdouble not connected electrically.

<sup>2)</sup> Also available in stainless steel.

<sup>3)</sup> Metric or US connection, per heat exchanger.

<sup>4)</sup> 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)
41030050	Replacement filter element F2; 5-pack
9144050038	Cable for cooler temperature analog output 4 m
4410005	Condensate trap GL1, 0.4 L
44920035012	Condensate pump replacement hose, Tygon (Norpren), angled hose nipple
44920035016	Condensate pump replacement hose, Tygon (Norpren), angled hose nipple and screw connection (metric)
44920035017	Condensate pump replacement hose, Tygon (Norpren), angled hose nipple and screw connection (US)
4381045	Screw connection G1/4 – DN 8/12 for passive condensate connection MTS or MTV(-2)
4381048	Screw connection NPT 1/4" for passive condensate connection MTS-I or MTV(-2)-I