Sample gas cooler TC-Standard+ X2

In emission measurement, 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 as well as measurements in small combustion plants or exhaust gas analysis in automotive engineering.

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-Standard+ 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
- One gas path
- Optimised heat exchanger type 2 in Duran glass or PVDF
- Adjustable outlet dew point and alarm thresholds
- Low operating noise
- Rated capacity 95/85 Btu/h, 104 °F / 122 °F - Version
- Dew point stability 0.2 °F
- Status display and output
- Cooling block temperature display
- Moisture detector connection, analog output, filter, and peristaltic pump optional

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Overview

The TC-Standard+ 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-Standard+ 6121 X2	TC-Standard+ 6122 X2

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

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

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.

Gas cooler technical data

Gas Cooler Technical Data						
Ready for operation	after max. 10 minutes					
Ambient temperature	41 °F to 122 °F					
Gas output dew temperature preset: adjustable:	 41 °F 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)		
	24 V DC	**230 V AC**	**115 V AC**	**24 V DC**	**230 V AC**	**115 V AC**
	±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: Moisture detector: Heat exchanger: Peristaltic pump: Tubing:	 see "Technical Data - Options" see "Technical Data - Options" see table "Heat Exchanger Overview" see "Technical Data - Options" 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					

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

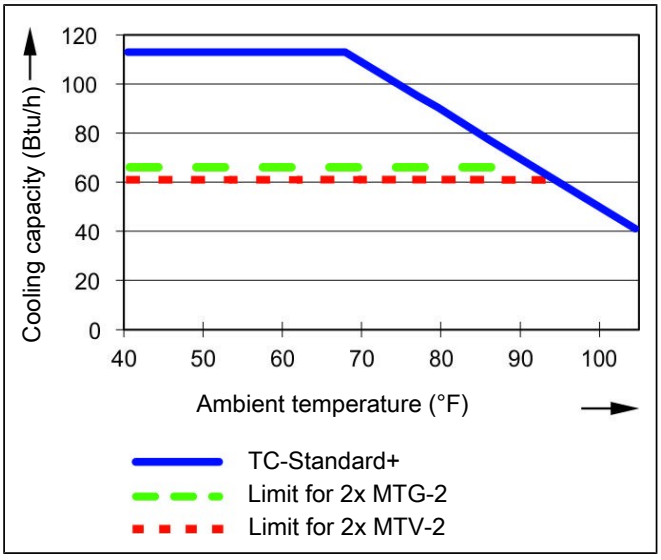
Technical Data FF-3-N Moisture Detector	
Ambient temperature	37 °F to 122 °F
max. operating pressure with FF-3-N	29 psi
Material	PVDF, PTFE, epoxy resin, stainless steel 1.4571, 1.4576

Technical Data peristaltic pump CPdouble X2	
Ambient temperature	32 °F to 122 °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

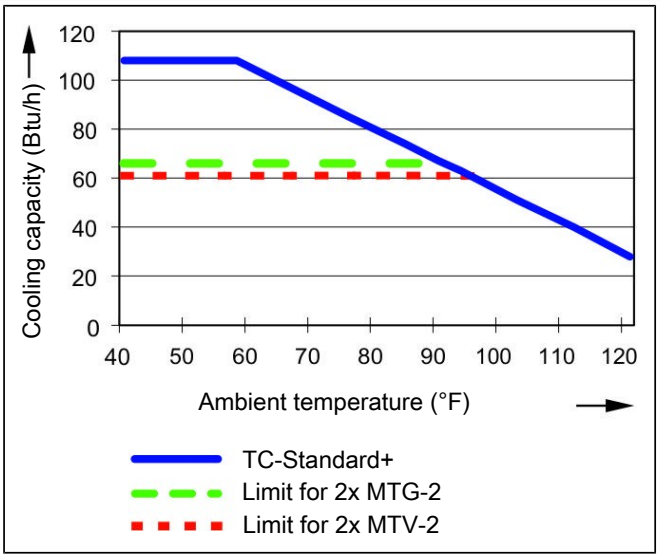
AGF-PV-30-F2 Filter Technical Data	
Ambient temperature	37 °F to 212 °F
max. operating pressure with filter	58 psi
Filter surface	9.3 in^2
Filter fineness	2 µm
Dead volume	3.47 cu. in.
Materials	
Filter:	PVDF, Duran glass (parts in contact with media)
Seal:	Viton
Filter element:	sintered PTFE

Performance curves

Model TC-Standard+ 6121 (X2)	
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 (X2)	
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 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 following limits for the maximum flow are specified for a standard operating point of T_e = 104 °F and ϑ_G = 158 °F. The maximum flow v_{max} in Nl/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 [3] 2x MTG-2-I [2] [3]	2x MTV-2 [3] 2x MTV-2-I [2] [3]
Materials in contact with media	Glass PTFE	PVDF
Flow rate v_{max} [1]	3.5 lpm	3.2 lpm
Inlet dew point $\tau_{e,max}$ [1]	158 °F	158 °F
Gas inlet temperature $\vartheta_{G,max}$ [1]	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 Δp (v=2.5 lpm)	0.28 psi	0.26 psi
Dead volume V_{tot}	2.3 cu. in.	2.1 cu. in.
Gas connections (metric)	GL14 (6 mm) [4]	DN 4/6
Gas connections (US)	GL14 (1/4") [4]	1/4"-1/6"
Condensate out connection (metric)	GL18 (8 mm) [4]	G1/4
Condensate out connection (US)	GL18 (8 mm) [4]	NPT 1/4"

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

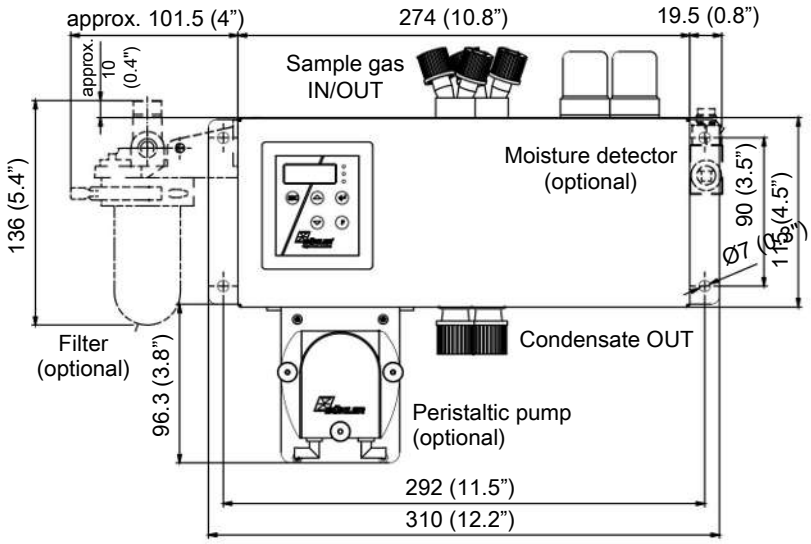
[2] Models marked I have NPT threads or US tubes, respectively.

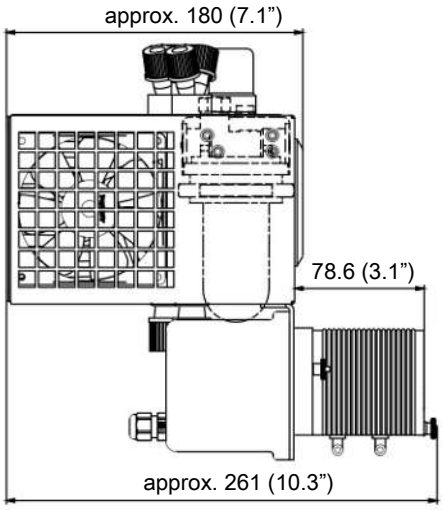
[3] Passive discharge via automatic condensate drains or traps not applicable for MTG-2 heat exchangers. For passive discharge on MTV-2 heat exchangers, use a screw connection with a clearance of at least 7 mm (9/32") (see accessories).

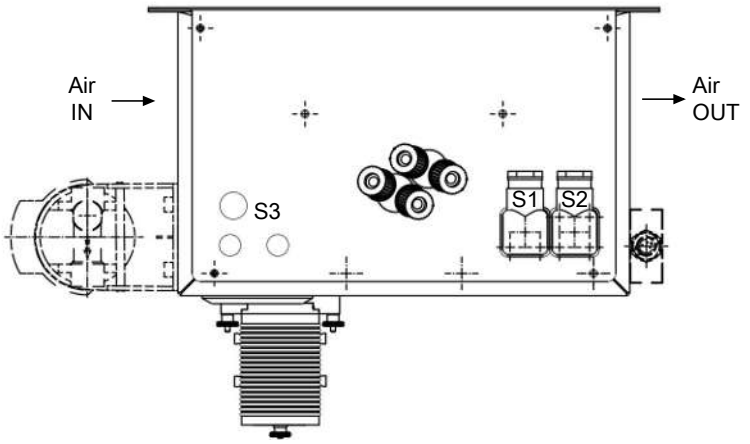
[4] Gasket inside diameter.

Dimensions (inch)

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







S1 = Electric supply
S2 = Status output
S3 = Analog output

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	2	X	1	X	X	X	0	X	X	X	0	0	0	0	Product Characteristics
																			Gas cooler models (with 2 in-line heat exchangers)
				1															TC-Standard+ 6121 X2 Ambient temperature 104 °F
				2															TC-Standard+ 6122 X2 Ambient temperature 122 °F
																			Certifications
					2														for explosive areas
																			Supply voltage
						1													115 V AC, 50/60 Hz
						2													230 V AC, 50/60 Hz
						4													24 V DC
																			Heat exchanger
							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
																			Condensate drain [1]
										0	0								without condensate drain
										2	0								CPdouble X2 with hose nipple, angled
										4	0								CPdouble X2 with screw connection [3]
																			Moisture detector/filter
												0	0						without filter, without moisture detector
												0	1						without filter, 1 moisture detector with PVDF adapter [2]
												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 additional

[1] 24 V DC CPdouble not connected electrically.

[2] Also available in stainless steel.

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

Consumables and accessories