



Sample gas cooler TC-Standard 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-Standard X2 series provides solutions for Zone 2 or Class I, Division 2.

Despite its small size, the TC-Standard X2 sample gas cooler already covers a large percentage of standard applications in gas analysis.

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 or two gas paths

Heat exchanger made from stainless steel, 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



Overview

The TC-Standard X2 series was designed specifically for high cooling capacities and high ambient temperatures.

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	
1 heat exchanger	TC-Standard 6111 X2	TC-Standard 6112 X2	3rd digit=1
2 heat exchangers	TC-Standard 6121 X2	TC-Standard 6122 X2	3rd digit=2
	4th digit=1	4th digit=2	

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 $\tau_a -1$ 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.

Delta T control option

Not all applications require an outlet dew point of 41 °F. In some applications a higher dew point is sufficient. In other applications a stable outlet dew point doesn't matter, it's enough for the gas to be dry, so if the outlet dew point has an adequate difference in temperature below the ambient temperature.

Here the electronics measure the ambient temperature and regulate the outlet dew point to an adjustable value below it. This extends the potential cooling capacity to the limits of the heat exchanger. Here it's important to note the outlet dew point fluctuates along with the ambient temperature and a stable dew point cannot be a prerequisite for the measurement.

The target temperature range is defined by the ambient temperature, the adjustable temperature difference and the alarm limits. If the block temperature is not within the target range with active Delta T-control, the status message "dL" will flash in the display.

Example: At a difference of 30 K/54 °F, at a set outlet dew point of 41 °F this means the dew point remains stable up to an ambient temperature of approx. 95 °F, and the safe drop is only preferred over the ambient temperature with ambient temperature peaks over 95 °F. The cooling capacity specified in the cooling capacity graphs at 95 °F is then available at above 95 °F.

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:	41 °F					
adjustable:	36 °F...68 °F or Delta T control					
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:	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					
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 pumps CPsingle X2 / CPdouble X2

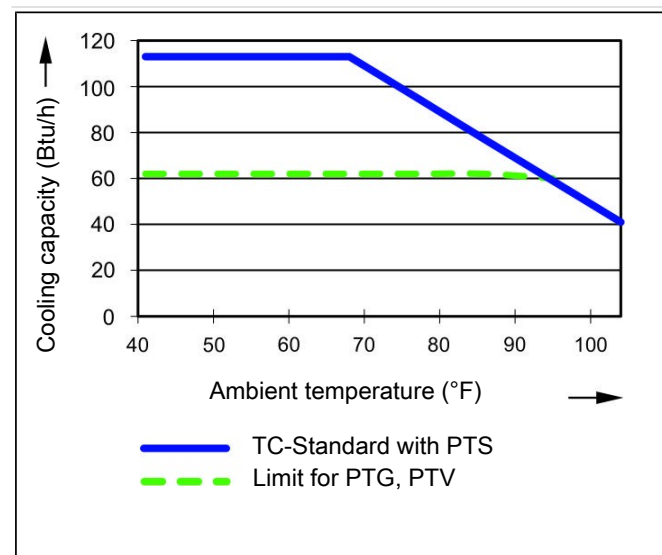
Ambient temperature	32 °F to 122 °F
Flow rate	0.005 lpm (50 Hz)/0.006 lpm (60 Hz) with standard hose
Vacuum inlet	max. 11.6 psi
Pressure inlet	max. 14.5 psi
Outlet pressure	14.5 psi
Hose	4 x 1.6 mm (0.04 in)
Condensate outlet	Hose nipple Ø6 mm (0.24 in) Screw connection 4/6 (metric), 1/6"-1/4" (US)
Protection class	IP 44
Materials	
Hose:	Norprene (Standard), Marprene, Fluran
Connections:	PVDF

AGF-PV-30-F2 Filter Technical Data

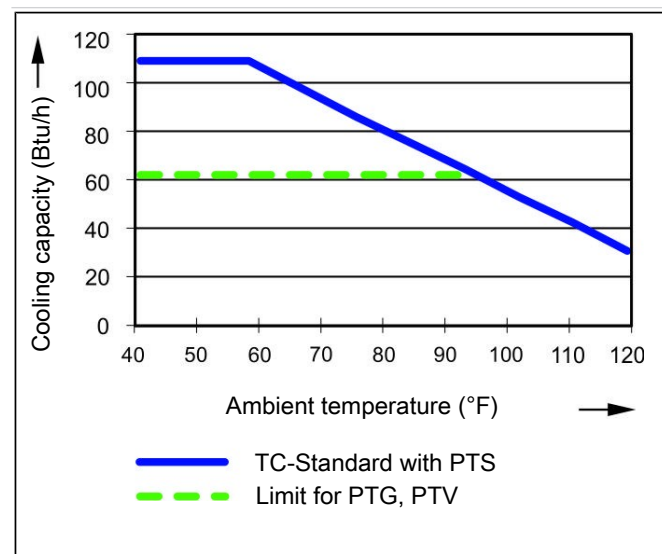
Ambient temperature	37 °F to 212 °F
max. operating pressure with filter	58 psi
Filter surface	9.3 in ²
Filter fineness	2 µm
Dead volume	3.47 cu. in.
Materials	
Filter:	PVDF, Duran glass (parts in contact with media)
Seal:	Viton
Filter element:	sintered PTFE

Performance curves
One heat exchanger
Model TC-Standard 6111 (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


Model TC-Standard 6112 (X2)

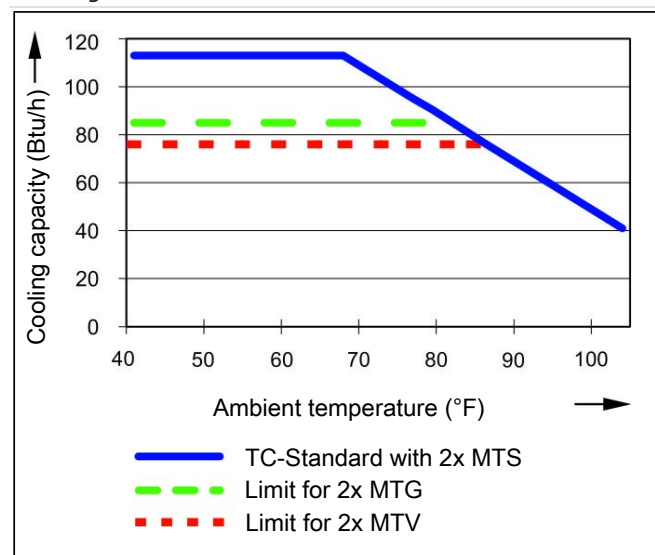
Rated cooling capacity (at 77 °F)	85 Btu/h
Max. Ambient temperature	122 °F
Dew point fluctuations	
static	± 0.1 K
in the entire specification range	± 1.5 K


Two heat exchangers
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

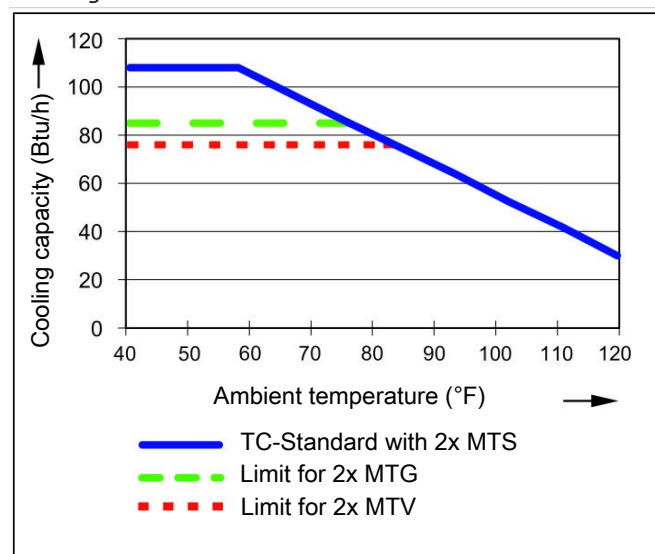
< 0.5 K


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 exchanger PTG, PTV or MTV apply to a dew point of 104 °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 $T_e = 104^\circ\text{F}$ and $\vartheta_G = 158^\circ\text{F}$. The maximum flow v_{\max} in l/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	PTS PTS-I ²⁾	PTG PTG-I	PTV PTV-I ²⁾	MTS ³⁾ MTS-I ^{2) 3)}	MTG ³⁾ MTG ³⁾	MTV ³⁾ MTV-I ^{2) 3)}
Materials in contact with media	Stainless steel	Glass PTFE	PVDF	Stainless steel PVDF	Glass PTFE	PVDF
Flow rate v_{\max} ¹⁾	7.5 lpm	4.2 lpm	4.2 lpm	5 lpm	3.5 lpm	3.2 lpm
Inlet dew point $\tau_{e,\max}$ ¹⁾	149 °F	149 °F	149 °F	149 °F	149 °F	149 °F
Gas inlet temperature $\vartheta_{G,\max}$ ¹⁾	356 °F	284 °F	284 °F	284 °F	284 °F	284 °F
Max. Cooling capacity Q_{\max}	142 Btu/h	85 Btu/h	85 Btu/h	90 Btu/h	76 Btu/h	62 Btu/h
Gas pressure p_{\max}	2321 psi	44 psi	29 psi	363 psi	44 psi	29 psi
Pressure drop Δp ($v=2.5$ lpm)	0.15 psi	0.15 psi	0.15 psi	0.29 psi	0.28 psi	0.26 psi
Dead volume V_{tot}	1.8 cu. in.	1.8 cu. in.	3.48 cu. in.	1.2 cu. in.	1.1 cu. in.	1 cu. in.
Gas connections (metric)	6 mm	GL 14 (6 mm) ⁴⁾	DN 4/6	6 mm tube	GL14 (6 mm)	DN 4/6
Gas connections (US)	1/4"	GL 14 (1/4") ⁴⁾	1/4"-1/6"	1/4" tube	GL14 (1/4")	1/4"-1/6"
Condensate out connections (metric)	G3/8	GL 25 (12 mm) ⁴⁾	G3/8	G1/4	GL18 (8 mm)	G1/4
Condensate out connections (US)	NPT 3/8"	GL 25 (1/2") ⁴⁾	NPT 3/8"	NPT 1/4"	GL18 (8 mm)	NPT 1/4"

¹⁾ Max. cooling capacity of the cooler must be considered.

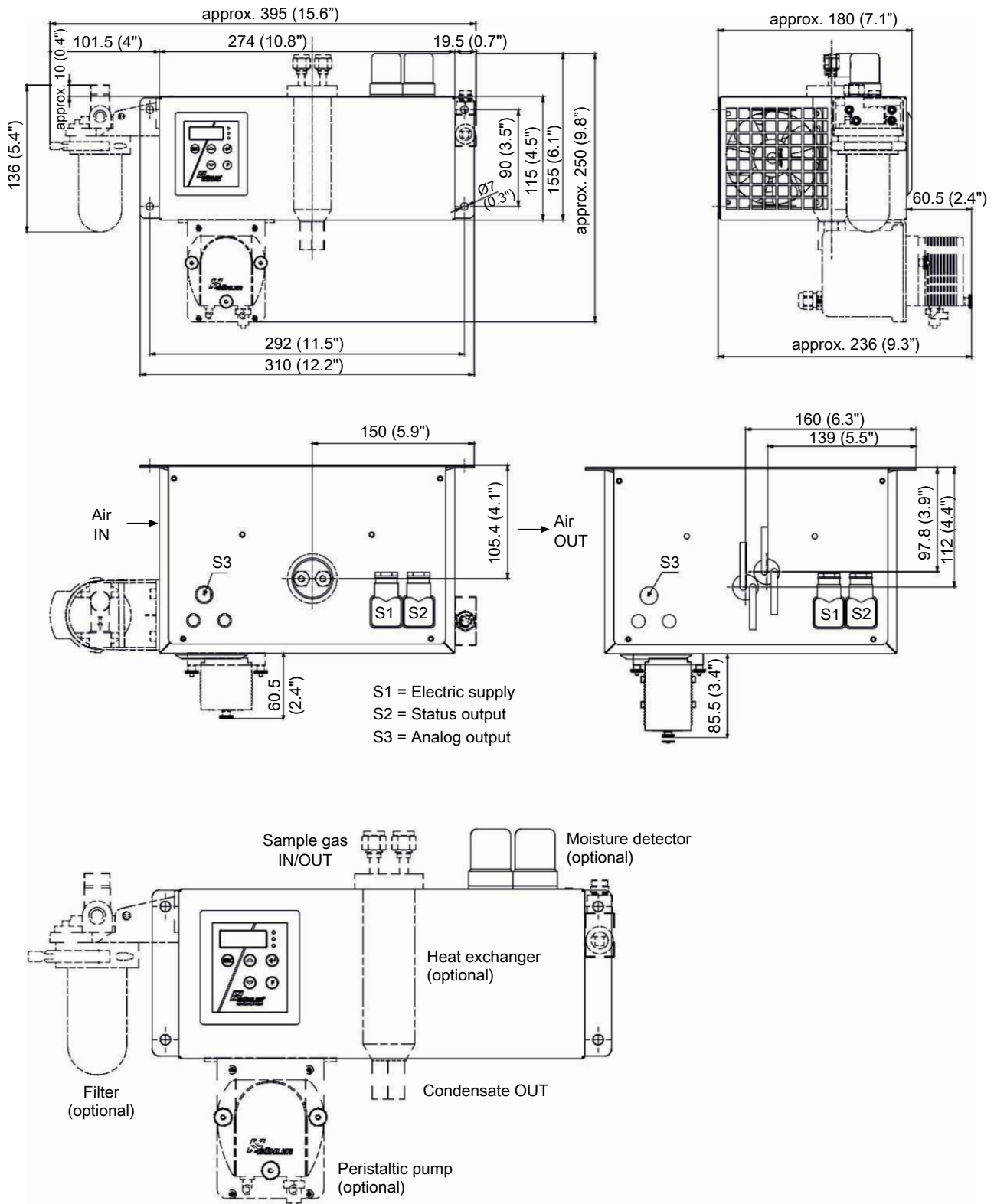
²⁾ Models marked I have NPT threads or US tubes, respectively.

³⁾ Passive discharge via automatic condensate drains or traps not applicable for MTG heat exchangers. For passive discharge on the MTS and MTV 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 611x and 612x):



Ordering instructions
Gas cooler models with one heat exchanger

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

4496	2	1	1	X	2	X	1	X	X	X	0	X	X	X	0	X	0	0	Product Characteristics
Gas cooler models (with 1 heat exchanger)																			
1																		TC-Standard 6111 X2: Ambient temperature 104 °F	
2																		TC-Standard 6112 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	1	0																Stainless steel, PTS, metric	
1	1	5																Stainless steel, PTS-I, US	
1	2	0																Duran glass, PTG, metric	
1	2	5																Duran glass, PTG-I, US	
1	3	0																PVDF, PTV, metric	
1	3	5																PVDF, PTV-I, US	
Condensate drain ¹⁾																			
0	0																	without condensate drain	
1	0																	CPsingle X2 with hose nipple, angled	
3	0																	CPsingle 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	
Delta T control																			
0	0																	without Delta T control	
1	0																	Delta T control option	

¹⁾ 24 V DC CPsingle not connected electrically.

²⁾ Also available in stainless steel.

³⁾ Metric or US connection, per heat exchanger.

Gas cooler models with two heat exchangers

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	2	X	X	X	0	X	X	X	0	X	0	0	Product Characteristics
Gas cooler models (with 2 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																			
2	1	0																Stainless steel, 2 MTS, metric	
2	1	5																Stainless steel, 2 MTS-I, US	
2	2	0																Duran glass, 2 MTG, metric	
2	2	5																Duran glass, 2 MTG-I, US	
2	3	0																PVDF, 2 MTV, metric	
2	3	5																PVDF, 2 MTV-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⁾	
0	2																	without filter, 2 moisture detectors with PVDF adapter ²⁾	
1	0																	1 filter, without moisture detector	
1	1																	1 filter with built-in moisture detector	
2	0																	2 filters, without moisture detector	
2	1																	2 filters, 1 moisture detector	
2	2																	2 filters, 2 moisture detectors	
Signal outputs																			
0	0																	status output only	
1	0																	Analog output, 4...20 mA additional	
Delta T control																			
0	0																	without Delta T control	
1	0																	Delta T control option	

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