



ModbusRTU



## Sample gas cooler TC-MIDI with -H<sub>2</sub>/-O<sub>2</sub> heat exchanger

When powerful cooling is required, the TC-MIDI sample gas cooler with -H<sub>2</sub>/-O<sub>2</sub> heat exchanger is the ideal solution for reliable cooling of hydrogen (H<sub>2</sub>) and oxygen (O<sub>2</sub>) in extractive gas analysis. Green hydrogen produced by electrolysis using renewable energy sources is the key to a sustainable, emission-free future in the energy industry.

The safe, reliable cooling of the sample gas is decisive for gas analytics in the electrolyser (e.g. for LEL monitoring), as a higher moisture content is to be expected with some processes. The moisture in the process gas can damage the sensitive measuring cells in the analyser, so the gas temperature is kept below gas dew point at all times, thus causing the moisture to be emitted. The condensate is discharged via an automatic condensate drain.

As well as material-refining measures to prevent hydrogen-induced component damage, the heat exchangers for the H<sub>2</sub> series are subjected to a leak test using helium. For the O<sub>2</sub> version, special cleaning processes are used to remove particles, oils and fats from parts coming into contact with media. The contamination limits are based on the internationally used and applicable guideline EIGA Doc 33/18 "Cleaning of Equipment for Oxygen Service".

For applications with high-purity hydrogen or oxygen.

Cleaning standard is based on EIGA Doc 33/18 as regards the absence of particles, oils and fats for heat exchangers with the O<sub>2</sub> version.

Materials in contact with media are suitability-tested for high H<sub>2</sub> and O<sub>2</sub> concentrations

Heat exchanger leak tests using helium are performed on the H<sub>2</sub> series as standard

Nominal cooling capacity 195 kJ/h (40 °C version) or 175 kJ/h (50 °C version)

Constant dew point stability  $\pm 0.1$  °C

Adjustable outlet dew point and alarm thresholds

Cooling block temperature display

Optional 4 - 20 mA or Modbus RTU signal output



## Overview

The TC-MIDI with -H<sub>2</sub>/-O<sub>2</sub> heat exchanger series was specially developed for use with high-purity hydrogen and oxygen.

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 ordering information category.

Application	Standard applications	
Operating temperature	40 °C	50 °C
1 heat exchanger for H <sub>2</sub> /O <sub>2</sub> applications	TC-MIDI 6111	TC-MIDI 6112

We also offer different signal outputs:

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

## 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 using the 5 buttons with the guidance of the menu. This applies to the target outlet dew point, which can be set from 2 to 20 °C (36 to 68 °F) (factory setting 5 °C/41 °F),

as well as the warning thresholds, which 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 settings for both values are 3 K.

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

The separated condensate can be drained via add-on automatic condensate drains.

## Delta T control option

Not all applications require an outlet dew point of 5 °C (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 "dt" will flash in the display.

**Example:** At a difference of 30 °C (30 K/54 °F), at a set outlet dew point of 5 °C (41 °F) this means the dew point remains stable up to an ambient temperature of approx. 35 °C (95 °F), and the safe drop is only preferred over the ambient temperature with ambient temperature peaks over 35 °C (95 °F). The cooling capacity specified in the cooling capacity graphs at 35 °C (95 °F) is then available at above 35 °C (95 °F).

**Gas cooler technical data**

<b>Gas cooler technical data</b>		
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 (0.7 g) 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	
Electrical data	Unit without add-on	
	<b>230 V AC</b>	<b>115 V AC</b>
	+5/-10%	+5/-10%
	50/60 Hz	50/60 Hz
	1.2 A	2.4 A
	200 W / 280 VA	
Status output switching capacity	max. 250 V AC, 150 V DC 2 A, 50 VA, potential-free	
Electrical Connections	Plug per EN 175301-803	
Parts in contact with media Heat exchanger:	see table "Heat Exchanger Overview"	

**Technical Data - Options**

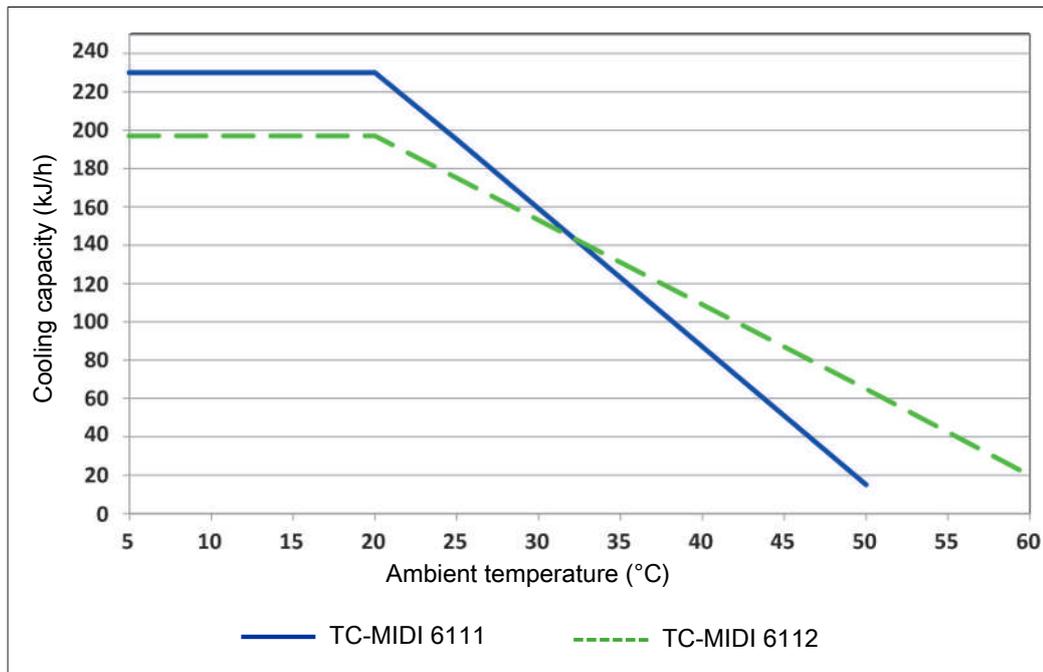
**Analogue Output Cooler Temperature Technical Data**

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

Performance Data



Note: The limit curves for the heat exchangers apply to a dew point of 50 °C.

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  $\tau_e = 50$  °C and  $\vartheta_G = 70$  °C. The maximum volume flow  $v_{max}$  in NI/h 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 TG heat exchanger the parameter triple  $\tau_e = 40$  °C,  $\vartheta_G = 70$  °C and  $v = 425$  NI/h may also be used in place of  $\tau_e = 50$  °C,  $\vartheta_G = 70$  °C and  $v = 345$  NI/h.

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

Heat exchanger overview

Heat exchanger	TS-H2/-O2 TS-I-H2/-O2 <sup>2)</sup>	DTS-H2/-O2 DTS-I-H2/-O2 <sup>2)</sup>
Materials in contact with media	Stainless steel	Stainless steel
Flow rate $v_{max}$ <sup>1)</sup>	500 l/h	2x 250 l/h
Inlet dew point $\tau_{e,max}$ <sup>1)</sup>	80 °C	80 °C
Gas inlet temperature $\vartheta_{G,max}$ <sup>1)</sup>	180 °C	180 °C
Max. cooling capacity $Q_{max}$	450 kJ/h	450 kJ/h
Gas pressure $p_{max}$	1.5 bar	1.5 bar
Pressure drop $\Delta p$ ( $v=150$ l/h)	8 mbar	5 mbar each
Dead volume $V_{dead}$	69 ml	28/25 ml
Gas connections (metric)	G1/4	6 mm tube
Gas connections (US)	NPT 1/4"	1/4" tube
Condensate out connection (metric)	G3/8	Tube 10 mm (6 mm)
Condensate out connection (US)	NPT 3/8"	Tube 3/8" (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.

# TC-MIDI with -H2/-O2 heat exchanger

## Dimensions (mm)

