

Product Group Gas Coolers.

Product Category Gas Conditioning.





EC30C with three SR25.2 peristaltic pumps

Ultra-Low Gas Cooler Series EC®

Version EC30C with graphical display for easy navigation, dew point up to -30 °C [-22 °F], max. 250 NI/h sample flow rate

Special Features

- **Cooling capacity 130 kJ/h over the entire permissible ambient temperature range**
- **250 NI/h max. sample gas flow rate**
- **Inlet water vapor dew point up to $+70\text{ °C}$ [$+158\text{ °F}$]**
- **Outlet dew point can be set from -20 to -30 °C [-4 to -22 °F]**
- **Outlet dew point stability $\pm 0.1\text{ °C}$ [$\pm 0.18\text{ °F}$]**
- **24/7 operation**
- **Icon-based warning & fault display including self-test with advance warning of upcoming maintenance**
- **mA output configurable**
- **Separate relays for active deep-freezing unit (TKS), alarm and warning messages**
- **Real-time alarm history with memory for over 700 messages**
- **Humidity alarm (external) and sample gas flow alarm (internal or external) are optionally available**
- **Service-friendly enclosure concept for 19" rack and wall mounting**

Application

The patented M&C ultra-low cooler EC30C is used in the gas analysis technique to reduce the dew point of humid sample gases, to provide a stable and very low dew point and prevent condensation and aerosol formation in the analyzer. The cooler EC30C can be mounted near the gas sample point to avoid costly energy-consuming heated sample lines. Due to the extremely stable and low gas outlet dew point, there are no water vapor cross-sensitivity and volumetric errors.

Description

The M&C gas cooler EC30C is a two-stage combination of compressor and Peltier cooler. The automatic defrost function of the dual deep-freezer unit ensures 100 % availability during operation.

The microprocessor-controlled electronics of the EC30C in combination with the graphical display offers a high degree of functionality, convenience in use and safe operation.

The EC30C is built for 24/7 operating time. The cooling capacity of 130 kJ/h is constant, even up to the maximum permissible ambient temperature. A capacity reserve enables the EC30C to largely compensate for the physically induced aging of the components and thus maximizes the service life of the cooler.

The pre-cooler unit is equipped with a Jet-Stream heat exchanger. The heat exchanger is cooled down to the constant temperature of $+2\text{ °C}$ [35.6 °F] by a separate microprocessor-controlled compressor cooling unit. The Jet-Stream heat exchanger in the pre-cooler unit removes a large amount of condensate, this ensures a safe and reliable pre-drying of the sample gas. An additional external vessel to separate the condensate is under normal conditions not necessary. The cooling unit of the pre-cooler dissipates the heat of the Peltier elements.

The dual deep-freezer unit is equipped with two modified Jet-Stream heat exchangers. Two separate pairs of Peltier elements are cooling the heat exchangers down to a con-

stant temperature between -20 °C [-4 °F] and -30 °C [-22 °F]. The factory setting is -30 °C [-22 °F].

The EC30C switches automatically every 3 hours between the two deep-freezer units. The deep freezer, which is currently not in use, will be defrosted. This actively prevents the heat exchangers from freezing and the gas lines from being clogged.

The new graphical user interface is icon-based for easy and intuitive navigation. The messages are displayed in the form of easy-to-understand icons.

Features like time stamps for the alarm message history, periodical self-monitoring and pre-warning messages to inform about upcoming maintenance work ensure a maximum degree of convenience, ease-of-use and safety when operating the EC30C.

The smart periodical self-monitoring of the EC30C helps to plan upcoming maintenance and service work to prevent unnecessary downtime.

A configurable mA output is part of the EC30C standard version.

Three optional peristaltic pumps SR-25.2 for automatic condensate removal can be installed into the unit.

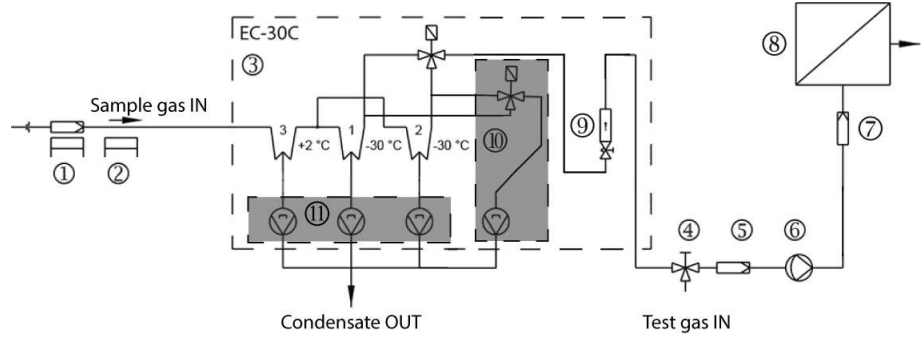
Optionally, an internal flow meter including flow alarm can be installed in the ultra-low cooler. Further options would be an external flow meter including flow alarm or an externally connected humidity alarm.

A fourth optional peristaltic pump can be installed in combination with a second solenoid valve to provide permanently fresh sample gas to the inactive deep-freezing unit. This ensures that even in systems, where water vapor cross-sensitivity exists, there are no visible peaks when switching the dual deep-freezer unit. This also prevents short peaks in the sample gas concentration due to stagnant gas.

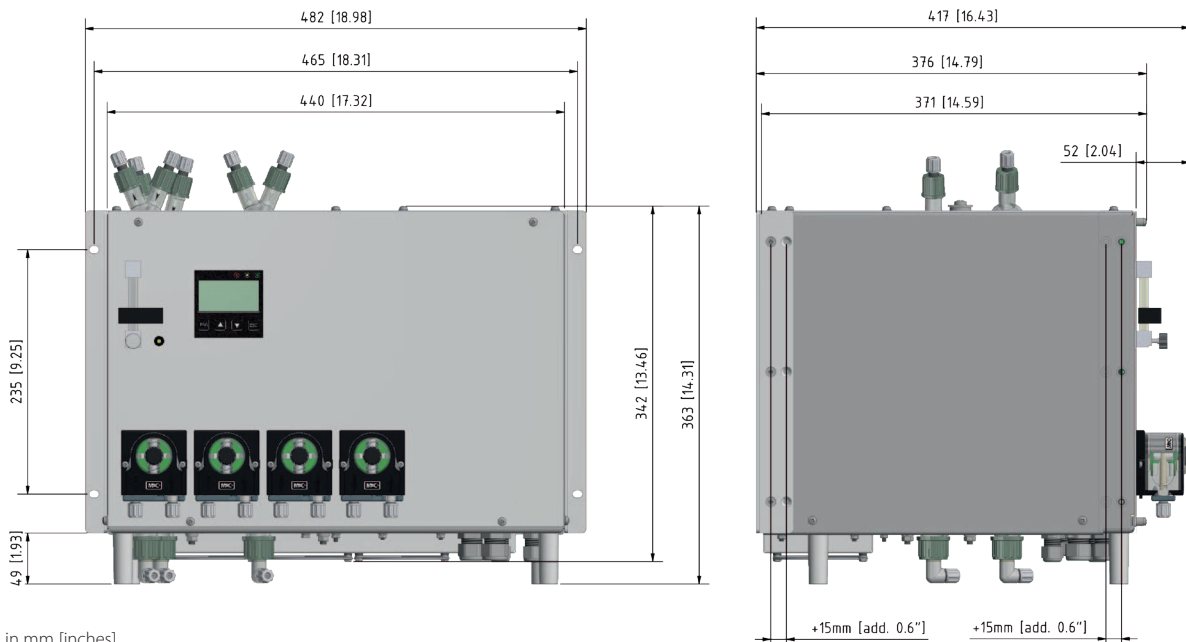
Example application for EC30C



- ① Heated filter sample probe SP2000-H
- ② Heated sample line 4M4/6
- ③ Ultra-low cooler EC30C
- ④ 3-way ball valves 3L/PV-1
- ⑤ Fine filter FP-2T-D with liquid alarm LA1
- ⑥ Full PTFE bellows pump MP-F
- ⑦ Aerosol filter CLF-5/W optional according to application
- ⑧ Analyzer, e.g. PMA1000
- ⑨ Flow meter FM 40, 25-250 NI/h
- ⑩ Option: heat exchanger purging with 4th peristaltic pump and solenoid valve
- ⑪ Option: 3 peristaltic pumps SR25.2

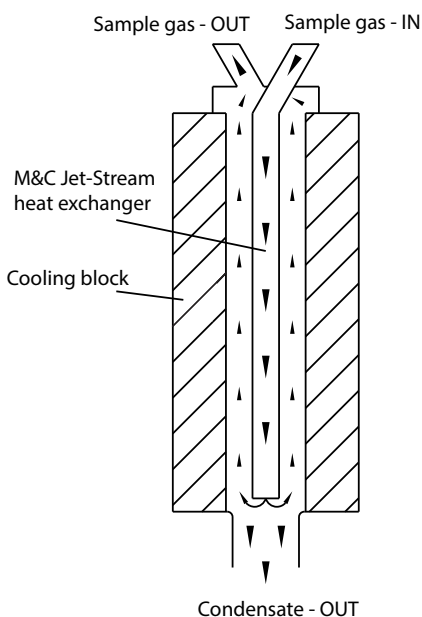


Dimensions



Dimensions in mm [inches]

Schematic diagram of M&C heat exchanger



Max. possible inlet water vapor dew point (°C)* depending on flow rate and incoming gas temperature

Flow rate NI/h	Incoming gas temperature °C [°F]				
	70 [158 °F]	90 [194 °F]	120 [248 °F]	150 [302 °F]	180 [356 °F]
90	70 [158 °F]	70 [158 °F]	69 [156.2 °F]	68 [154.4 °F]	67 [152.6 °F]
110	68 [154.4 °F]	67 [152.6 °F]	66 [150.8 °F]	65 [149 °F]	63 [145.4 °F]
130	65 [149 °F]	64 [147.2 °F]	63 [145.4 °F]	61 [141.8 °F]	59 [138.2 °F]
150	62 [143.6 °F]	61 [141.8 °F]	59 [138.2 °F]	58 [136.4 °F]	56 [132.8 °F]
170	59 [138.2 °F]	58 [136.4 °F]	56 [132.8 °F]	55 [131 °F]	53 [127.4 °F]
190	57 [134.6 °F]	56 [132.8 °F]	54 [129.2 °F]	52 [125.6 °F]	50 [122 °F]
210	55 [131 °F]	54 [129.2 °F]	52 [125.6 °F]	49 [120.2 °F]	46 [114.8 °F]
230	53 [127.4 °F]	52 [125.6 °F]	49 [120.2 °F]	47 [116.6 °F]	43 [109.4 °F]
250	52 [125.6 °F]	50 [122 °F]	47 [116.6 °F]	44 [111.2 °F]	41 [105.8 °F]

* This table shows the values of the max. possible inlet water vapor dew point depending on flow rate and incoming sample gas temperature. These values correspond to the max. cooling capacity of 130 kJ/h, and they must not be exceeded.

Cooler Series EC*	Version EC30C	
Part No.	02K6100	02K6100a
Sample gas connection	Tube connector DN 4/6	
Condensate connections	3 x tube connector GL 25-12 mm	
Material of sample-contacting parts	Duran® glass, PTFE, PVDF	
Single stream, gas flow rate	90 to 250 NI/h	
Gas pressure	Max. 3 bar abs.	
Ambient temperature	+5 to +45 °C [+41 to +113 °F]	
Storage temperature	-20 to +60 °C [-4 to +140 °F]	
Sample outlet dew point	-20 to -30 °C [-4 to -22 °F], default -30 °C [-22 °F]	
Sample inlet temperature	Max. 180 °C [356 °F]	
Inlet water vapor dew point	Max. 70 °C [158 °F]	
Cooling capacity	Max. 130 kJ/h* (at given input conditions)	
Main power connection/power consumption	230 V 50 Hz/380 VA	115 V 60 Hz/380 VA
Start-up time	< 60 min.	
Dead volume	Approx. 160 ml [≈ 5.4 fl. oz]	
ΔP at 250 NI/h flow rate	5 mbar	
Electrical connection	2.5 mm ² terminals, cable glands 1 x M12, 2 x M16, 2 x M20	
mA output	0 - 20 mA/4 - 20 mA, max. 500 Ohm load (including cable resistance),	
Relay output alarm	1 changeover contact: 230 V AC 3 A, 24 V DC 3 A Alarm: COM & NC closed No alarm: COM & NO closed	
Relay output warning	1 NO contact, 24 V (AC/DC), 0.5 A Warning: open	
Relay output freezer units I and II	1 NO contact, 24 V (AC/DC), 0.5 A Unit I on: closed Unit II on: open	
Case protection	IP20 EN 60529	
Electrical equipment standard	EN 61010	
Method of mounting	19" rack or wall-mount	
Case color	RAL 9003	
Dimensions (W x H x D)	19" or wall-mount device with mounting brackets: 482 x 342 x 376 mm [≈ 19" x 13.5" x 14.8"] Device with equipment feet: 440 x 363 x 371 mm [≈ 17.3" x 14.3" x 14.6"]	
Weight	Approx. 39.4 kg [≈ 86.9 lbs]	

* For the given input conditions, please refer to table: "Max. possible inlet water vapor dew point (°C) depending on flow rate and incoming gas temperature".

Duran® is a brand name for borosilicate glass produced by the German company DWK Life Sciences GmbH.

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

Options

Part No.	Options for EC30C
01P9145	Peristaltic pump SR25.2, to mount at the front panel of the EC30C (three peristaltic pumps are required)
03F3000	Aerosol filter CLF-5: External mounting in the outlet of an ultra low gas cooler EC30C when sample tends to form aerosols. Technical data, see data sheet "Fluid Particle Filter Series CLF", Version CLF-5, CLF-5/W for removal of aerosols from gases"
02K9700	Heat exchanger purging: 4th peristaltic pump with solenoid valve for EC30C with 230 V/50 Hz
02K9700a	Heat exchanger purging: 4th peristaltic pump with solenoid valve for EC30C with 115 V/60 Hz
02K9710	FM 40 (Flow meter, 25-250 NI/h)
03E1001	LA 1S (Humidity sensor)
02E3500	FA 20 (Flow sensor)



EC-L-2G/SR25.2

Gas Cooler Series EC®

Compact Version EC-L
for 2 x 250 NI/h or 1 x 500 NI/h

Special Features

- **Upgradable to a complete gas conditioning unit**
- **Patented Jet-Stream heat exchangers available in 3 standard materials**
- **Gas flow 2 x 250 NI/h or 1 x 500 NI/h**
- **Ambient pre-cooling stage(s) optionally**
- **Ambient temperature up to 45 °C [up to 113 °F]**
- **Dew point stability < ±0.1 °C [< ±0.18 °F]**
- **Outlet dew point adjustable from +2 to +7 °C [35.6 to 44.6 °F]**
- **Status alarm contact**
- **High reliability**
- **Self-controlled**
- **CFC-free**

Application

The M&C gas cooler EC-L is used in gas analysis to lower the dew point of humid gas to prevent condensation in the analyzer(s). An extremely stable and low gas outlet dew point minimizes water vapor cross-sensitivity and volumetric errors. Additionally components for the gas conditioning such as filter or sample gas pump can be integrated.

Description

The ECL cooler is compact, self-controlling and requires minimum maintenance. Intelligent detailed solutions provide optimum cooling of the sample gas and ensure reliable separation of condensate.

The new controlled compressor cooling system and the special design of the Jet-Stream heat exchangers ensure optimum dew point reduction to a low, stable value. Another advantage of the Jet-Stream principle is a short contact time between sample gas and condensate. This minimizes washout effects of water-soluble sample gas components. For applications with high water vapor content, an additional pre-cooling stage can be installed. This one- or two-stage pre-cooling unit reduces the inlet dew point or the load on the main cooling stage.

The condensate is optionally discharged by the integrated small peristaltic pumps SR25.2 or externally by the condensate drains AD or the collection vessels TG/TK.

The practical design allows the installation of heat exchangers made of different materials depending on the application. Heat exchangers made of glass, stainless steel or PVDF can be ordered optionally.

The digital display on the front panel shows the current cooler temperature. The cooler function can be monitored externally via an alarm contact. The factory settings of the alarm limits are < +2 °C [35.6 °F] and > +8 °C [46.4 °F].

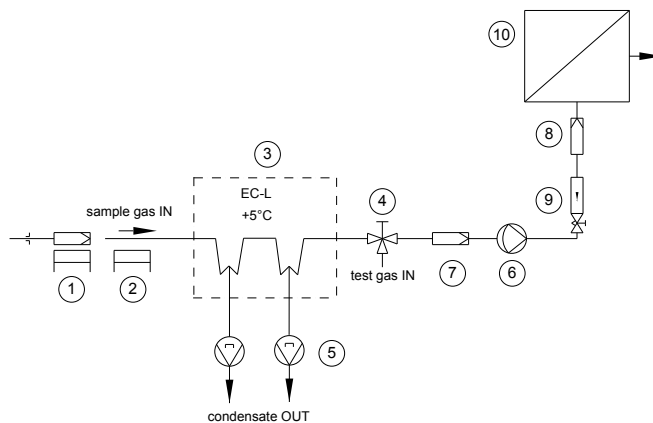
The EC-L gas cooler can be equipped with 2 x heat exchangers for a flow rate of max. 500 NI/h. This allows two separate sample gas lines with a maximum flow rate of 2 x 250 NI/h or one sample gas line for a maximum flow rate of 500 NI/h to be connected.

The compact and lightweight design ensures space-saving and easy installation in gas conditioning systems. The EC-L gas coolers are self-monitoring and require minimum maintenance.

If necessary, the cooler can be upgraded to a complete gas conditioning unit. For this purpose, a mounting plate is attached to the cooler in order to install the required components such as a pump or a filter with liquid alarm sensor.

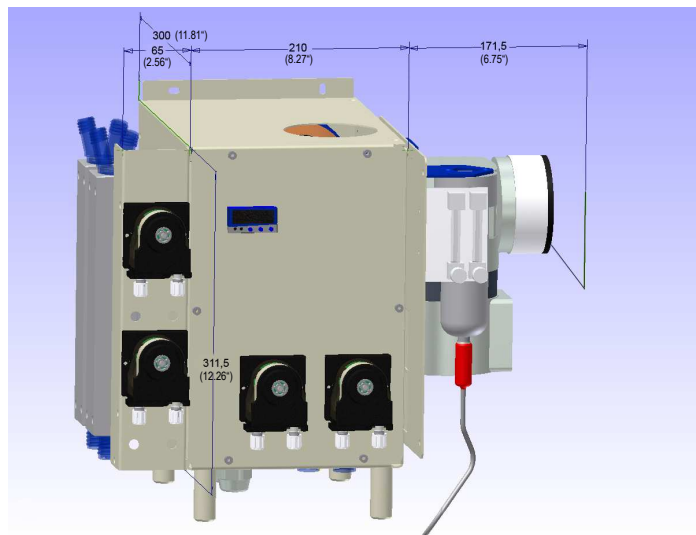
Application example for EC-L

- 1 Gas sample probe or dilution probe
- 2 Heated sample line
- 3 Gas cooler EC-L
- 4 3-way ball valve
- 5 Peristaltic pump SR25.2
- 6 Diaphragm pump
- 7 Fine filter FP-2T-D with liquid alarm LA1S
- 8 Aerosol filter CLF-5/W optional according to application
- 9 Flow meter FM40, 25-250 NI/h
- 10 Analyzers



Dimensions

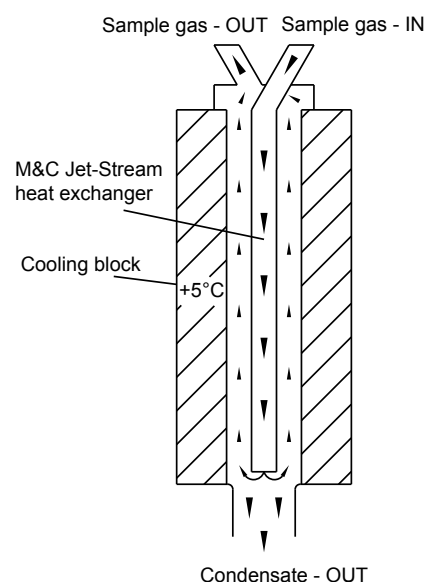
Compact gas cooler EC-L with pre-cooler, filter, liquid alarm sensor and diaphragm pump



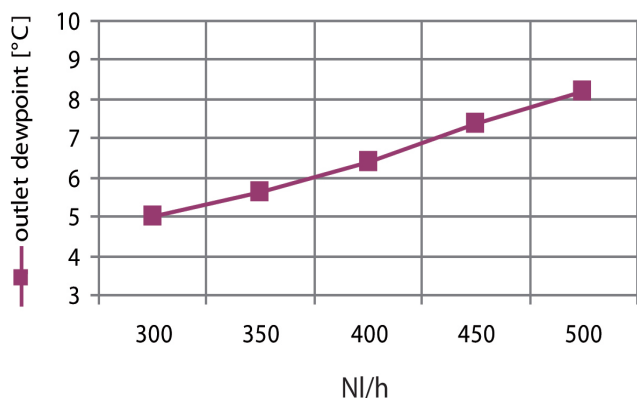
Dimensions in mm

Drawing shows EC-L with two heat exchangers out of glass, two pre-cooling stages, peristaltic pumps, a filter with liquid alarm sensor and a diaphragm pump.
Heat exchanger(s), peristaltic pump(s), filter with liquid alarm sensor and diaphragm pump to be ordered optionally!

Functional diagram of M&C Jet-Stream heat exchanger



Sample gas outlet dew point stability for EC-L-2G



Sample gas outlet dew point stability at gas inlet dew point of 80 °C.
Heat exchangers are connected in series.
Characteristics of heat exchanger out of PVDF or stainless steel upon request.

Technical Data

Gas Cooler Series EC*	Version EC-L
Part No. basic cooler without heat exchanger, 230 V 50 Hz	02K4000X
Part No. basic cooler without heat exchanger, 115 V 50-60 Hz	02K4000Xa
Number of heat exchangers	2
Ambient temperature	+10 up to +45 °C [50 up to 113 °F]
Sample outlet dew point	Range of adjustment: +2 to +7 °C [35.6 to 44.6 °F], factory setting: +5 °C [41 °F]
Dew point stability	At constant conditions < ±0.1 °C [< ±0.18 °F]
Sample inlet temperature***	Max. 180 °C [max. 356 °F]
Sample inlet dew point***	Max. 80 °C [max. 176 °F]
Total cooling capacity	144 kJ/h at +10 to +45 °C [50 to 113 °F] ambient temperature
Ready for operation	< 15 min.
Main power connection/power consumption	230 V AC* or 115 V AC**(a) -15 %/+10 %, 50/60 Hz, max. 200 VA start-up current: 230 V 50 Hz = 2.5 A/115 V 60 Hz = 4.5 A
Electrical connection	Terminals 2.5 mm ² , 2 x M20
Status alarm 2 contacts, potential-free	Contact rating 250 V AC, 2 A, 500 VA, 50 W, alarm limit settings < +2 °C [<35.6 °F] and > +8 °C [> 46.4 °F]*
Type of housing protection/electrical standard	IP20 EN 60529/EN 61010
Method of mounting/case colour	Wall-mounting/case colour gray, RAL 9003
Dimensions (W x H x D)	210 x 380 x 350 mm [≈ 8.3" x 15" x 13.8"] (height including cooler feet and depth including peristaltic pump)
Weight	17.6 kg [≈ 38.8 lbs] (with 2 x SR25.2 and 2 x glass heat exchangers)

Options

Options for basic cooler	EC-L		
Heat exchanger type	ECL-G	ECL-PV	ECL-SS
Part No.	97K0605	97K0610	97K0600
Material of heat exchanger	Duran® glass	PVDF	SS 316Ti
Max. gas flow rate per heat exchanger	250 NI/h***	250 NI/h***	250 NI/h***
Gas pressure max. bar abs. ³⁾	2/3 ²⁾	3	10*
Sample gas connection	GL 18 for ø 6 mm o.d. tube*	Tube ø 6 mm*	Tube ø 6 mm
Condensate connection	GL 25 for ø 12 mm tube* ø 8 mm or ø 10 mm	G 3/8"i	G 3/8"i or 3/8 NPT**
ΔP at max. flow rate	1 mbar	1 mbar	1 mbar
Stagnant space approximately	50 ml [≈ 0.013 gal]	50 ml [≈ 0.013 gal]	50 ml [≈ 0.013 gal]
Peristaltic pump SR25.2	1 pc. integrated into the cooler, compl. installed, Part No.: 01P9125 cooler weight plus 0.6 kg [≈ 1.3 lb] per pump		

One ambient pre-cooling stage, without heat exchanger, completely installed, Part No.: 02K4020

Two ambient pre-cooling stages, without heat exchanger, completely installed, Part No.: 02K4022

Mounting bracket for installing up to two peristaltic pumps, Part No.: 02K4030

Peristaltic pump for pre-cooling stage, one peristaltic pump for each pre-cooling stage needed, Part No.: 01P9125

Mounting plate for gas conditioning components like filter or pump, completely installed, Part No.: 97K0631

Analog output for cooler temperature on request

* Standard, other version upon request.

** Option

*** Maximum values in technical data must be rated in consideration of the total cooling capacity at 25 °C [77 °F] ambient temperature.

²⁾ With GL connecting adapter.

³⁾ With SR25.2 max. 2 bar abs.

Duran® is a brand name for borosilicate glass produced the company Duran Group GmbH.

Order example:

1 cooler EC-L with 2 x heat exchangers out of glass ECL-G and 2 x peristaltic pumps SR25.2, power: 115 V 60 Hz, Part. No. 1 x 02K4000Xa; 2 x 97K0605; 2 x 01P9125

GL adapters and tube fittings for the connection of different tube diameters at the heat exchanger see data sheets 'Fittings for GL-Connections' and 'Hose & Tube Fittings'



ECM-2 G/SR25.2

Gas Cooler Series EC®



Compact Versions ECM-1 and ECM-EX2-1
for 1 x 250 NI/h

Compact Versions ECM-2 and ECM-EX2-2
for 2 x 150 NI/h

Special Features

- **Small dimensions and lightweight design**
- **ATEX and CSA certified version for hazardous zone 2 areas**
- **Gas flow 1 x 250 or 2 x 150 NI/h**
- **Jet-Stream heat exchangers in various materials**
- **Ambient temperature up to 50 °C [122 °F]**
- **Outlet dew point adjustable from +2 to +7 °C [35.6 to +44.6 °F]**
- **Dew point stability ± 0.1 °C [±0.18 °F]**
- **Digital temperature display**
- **Configurable status alarm contact**
- **Compact wall-mounting housing**
- **High reliability**

Application

The M&C gas cooler ECM is used in gas analysis to lower the dew point of humid gas to prevent condensation in the analyzer. An extremely stable and low gas dew point minimizes water vapour cross-sensitivity and volumetric errors.

The ATEX and CSA certified versions ECM-EX2-1 and ECM-EX2-2 can be used in Ex zone 2 and can also be equipped with up to 2 standard SR25.2 peristaltic pumps.

The compact and lightweight design ensures space-saving and easy installation in gas conditioning systems. The ECM gas coolers are self-monitoring and require only minimum maintenance.

Description

The ECM gas cooler is compact, self-controlling and requires only minimum maintenance. Detailed solutions ensure optimum cooling of the sample gas with minimal wash-out effects and guarantee reliable separation of the condensate.

The forced ventilation compressor cooling system with new control and the special design of the Jet-Stream heat exchangers ensure optimum dew point reduction to a low, stable value and reliable condensate separation. External condensate pre-separation is not required under normal conditions.

The condensate is optionally discharged by means of the integrated peristaltic pumps SR25.2 or externally by condensate traps AD or collecting vessels TG/TK. The practical design allows the installation of heat exchangers made of different materials depending on the application. The heat exchangers can be ordered optionally.

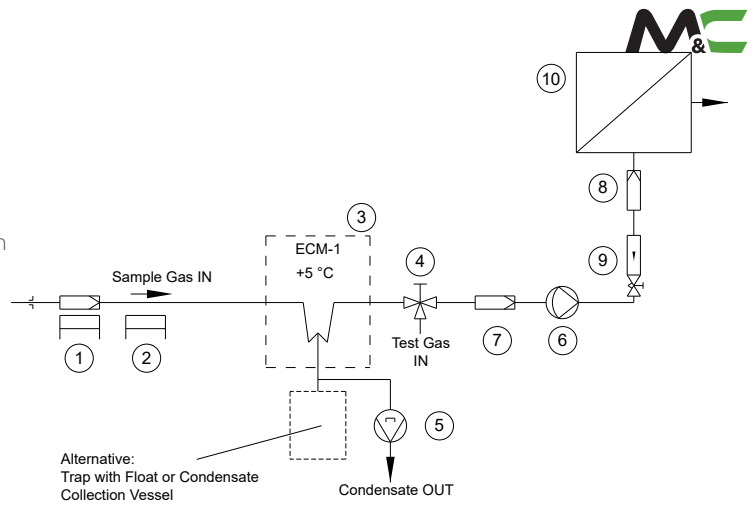
The digital display on the front panel shows the current cooler temperature. The cooler function can be monitored externally via an alarm contact. The alarm limits are set to < +2 °C and > +8 °C at the factory.

The 1-channel gas cooler ECM-1 can be equipped with a Jet-Stream heat exchanger for a flow rate of max. 250 NI/h.

The 2-channel gas cooler ECM-2 can be equipped with two Jet-Stream heat exchangers for a flow rate of max. 150 NI/h each.

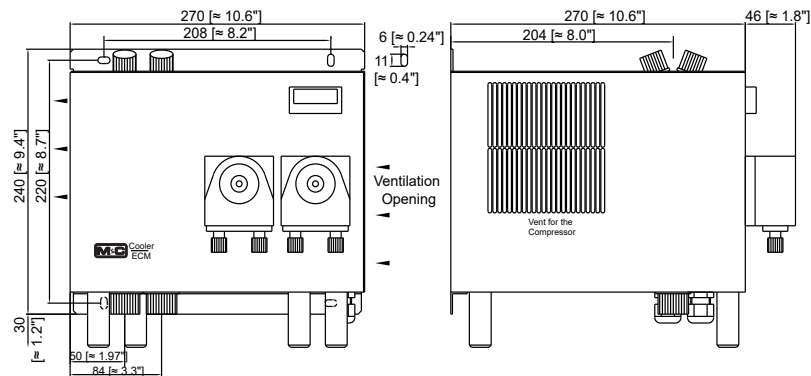
Application Example for ECM-1

- 1 Heated filter sample probe SP210-H or SP2000-H
- 2 Heated sample line 4M4/6
- 3 Cooler ECM-1G
- 4 3-way ball valve 3L/PV-1
- 5 Peristaltic pump SR25.2
- 6 Diaphragm pump MP47 or MP06/12 or N5KP
- 7 Fine filter FP-2T-D with liquid alarm LA1
- 8 Aerosol filter CLF-5/W optionally according to application
- 9 Flow meter FM10 or FM40, 25-250 NI/h
- 10 Analyzers, e.g. PMA1000



Dimensions

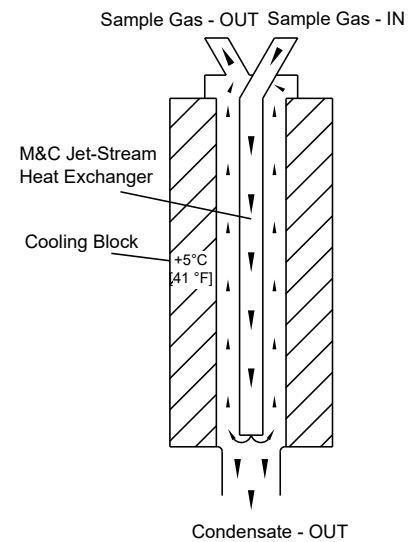
Compact Gas Cooler ECM-1/ECM-2/ECM-EX2-1/ECM-EX2-2



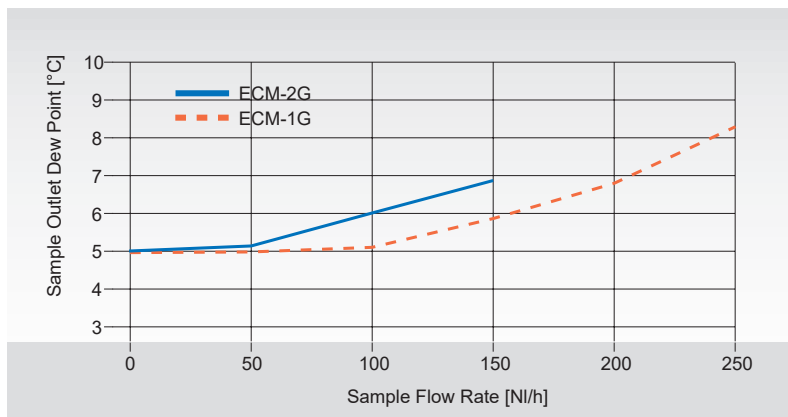
Dimensions in mm [Inches]

Drawing shows ECM-2G with two heat exchangers out of glass.
Heat exchanger(s) and peristaltic pump(s) to be ordered optionally!

Functioning Diagram of M&C Jet-Stream Heat Exchanger



Sample Gas Outlet Dew Point Stability



Sample gas outlet dew point stability at gas inlet dew point of 60 °C [140 °F].
Characteristics of heat exchanger out of PVDF or stainless steel upon request.

Technical Data

Gas Cooler Series EC*	Version ECM-1	Version ECM-2	Version ECM-EX2-1	Version ECM-EX2-2
Part No. for basic cooler without heat exchanger	02K7500X* (a)**	02K7510X* (a)**	02K7600X* (a)**	02K7610X* (a)**
Max. number of heat exchanger(s)-	1	2	1	2
Ambient temperature	+10 up to +50 °C [+50 to +122 °F]			
Storage temperature	-20 to +60 °C [-4 to +140 °F]			
Sample outlet dew point	Range of adjustment: +2 to +7 °C [+35.6 to +44.6 °F], factory setting: +5 °C [+41 °F]			
Dew point stability	At constant conditions < ±0.1 °C [±0.18 °F]			
Sample inlet temperature***	Max. 180 °C [356 °F]		***Max. +180 °C [356 °F] if cooler is mounted in Ex zone with temperature class T3 ***Max. +120 °C [248 °F] if cooler is mounted in Ex zone with temperature class T4	
Sample inlet dew point***	Max. 80 °C [176 °F]			
Total cooling capacity	144 kJ/h at +10 to +50 °C [+50 to +122 °F] ambient			
Ready for working	< 15 min.			
Main power connection/power consumption	230 V AC* or 115V AC**(a) -15 %/+10 %, 50/60 Hz, max. 200 VA Start up current: 230 V 50 Hz = 2.5 A / 115 V 60 Hz = 4.5 A			
Electrical connection	Terminals 2.5 mm ² , 2 x PG11 cable glands			
Status alarm 2 contacts, potential-free	Contact rating 250 V AC, 2 A, 500 VA, 50 W, alarm point < +2 °C [35.6 °F] and > +8 °C [46.4 °F]*			
ATEX/CSA certificate No..			230 V/115 V: II 3G Ex ec nC IIC T4 Gc (Zul.-Nr.: BVS 16 ATEX E 055 X) 230 V/115 V: Class I, Div. 2, Groups A/B/C/D, T4 / CAN/CSA-C22.2 No 61010.1-4; No. 213-M87.	
Electrical safety	EN 61010 CAN/CSA-C22.2 No.61010.1-04 UL Std. No. 61010-1(2nd Edition)			
System of protection	IP20 EN60529			
Method of mounting/case colour	Wall-mounting/RAL 9003			
Dimensions (W x H x D)	270 x 270 x 316 mm [≈ 10.6" x 10.6" x 12.4"]			
Weight	12 kg [≈ 26.5 lbs] (version 230 V)/13.5 kg [≈ 29.8 lbs] (version 115 V)			

Options

Options for basic cooler	ECM-1 and ECM-EX2-1			ECM-2 and ECM-EX2-2		
Heat exchanger type	ECM-1G	ECM-1PV	ECM-1SS	ECM-2G	ECM-2PV	ECM-2SS
Part No.	93K0140	93K0170	93K0160	97K0100	97K0110	97K0115
Material of heat exchanger	Duran® glass	PVDF	SS 316Ti	Duran® glass	PVDF	SS 316Ti
Max. gas flow rate per heat exch.	250 NI/h***	250 NI/h***	250 NI/h***	150 NI/h***	150 NI/h***	150 NI/h***
Gas press. max. bar abs. ³⁾	2/3 ²⁾	3	10*	2/3 ²⁾	3	10*
Sample gas connection	GL 18 for ø 6 mm o.d. tube*	G 1/4" i	G 1/4" i* or 1/4" NPT**	GL 18 for ø 6 mm o.d. tube*	Tube ø 6 mm*	Tube ø 6 mm
Condensate connection	GL 25 for ø 12 mm tube* ø 8 mm or ø 10 mm**	G 3/8" i	G 3/8" i or 3/8 NPT**	GL 25 for ø 12 mm tube* ø 8 mm or ø 10 mm**	G 3/8" i	G3/8" i or 3/8 NPT**
ΔP at max. flow rate	1 mbar	1 mbar	1 mbar	1 mbar	1 mbar	1 mbar
Stagnant space approximately	100 ml	100 ml	100 ml	40 ml	25 ml	30 ml
Peristaltic pump SR25.2	1 pc. integrated into the cooler, compl. installed, Part No.: 01P9125 cooler weight plus 0.6 kg [≈ 1.3 lbs] per pump					

* Standard, other version on request.

** Option

*** Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature and 5 °C [41 °F] outlet dew point.

²⁾ With GL connecting adapter.

³⁾ With SR25.2 max. 2 bar abs

Duran® glass is a brand name for borosilicate glass produced by the German company Duran Group GmbH.

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

Order example:

1 cooler ECM-2 with 2 heat exchangers out of glass ECM-2G and 2 peristaltic pumps SR25.2, power 115 V/60 Hz: Part. No. 1 x 02K7510xa; 2 x 97K0100; 2 x 01P9125

GL adapters and tube fittings for connecting different tube diameters at the heat exchanger see data sheets "Fittings for GL Glass Connections" and "Flexible and rigid tube fittings, plugs and connectors with barbed fitting".



ECP 1000-G

Peltier Gas Cooler Series ECP®

Version ECP1000 with 1 x 150 NI/h

Version ECP2000 with 2 x 150 NI/h

Version ECP3000 with 1 x 350 NI/h

Special Features

- With Jet-Stream heat exchanger available in three standard materials
- Ambient temperature up to +50 °C [122 °F]
- Gas outlet dew point adjustable from +2 to +15 °C [35.6 to 59 °F]
- Dew point stability ± 0.1 °C [± 0.18 °F]
- Status alarm contact
- Compact and lightweight design
- High reliability
- Self-controlling

Application

The M&C gas coolers type ECP are used in analytical technology for lowering the dew point of humid gases to prevent condensation in the analyzer. An extremely stable gas outlet dew point minimizes vapour cross-sensitivity and volumetric errors.

Description

The electronically controlled Peltier gas coolers and the special design of the Jet-Stream heat exchangers ensure optimum dew point reduction to a low, stable value and reliable condensate separation. External condensate pre-separation is not required.

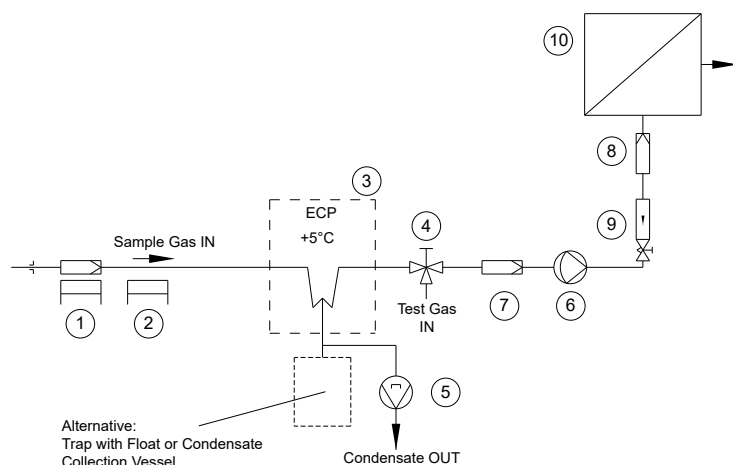
The condensate is discharged externally by means of a peristaltic pump, trap or collecting vessel. The practical design allows the installation of heat exchangers made of different materials depending on the application.

LEDs indicate the operating status as well as low and high temperatures. If the temperature deviates by ± 3 °C [± 5.4 °F], an alarm function is triggered.

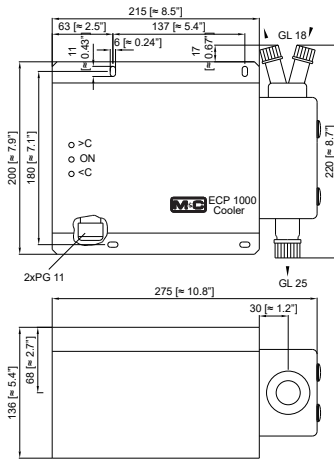
Due to the small and lightweight design as well as a very fast operational readiness, the Peltier gas coolers are particularly suitable for portable and compact stationary gas conditioning systems. The gas coolers are self-monitoring.

Application example for ECP

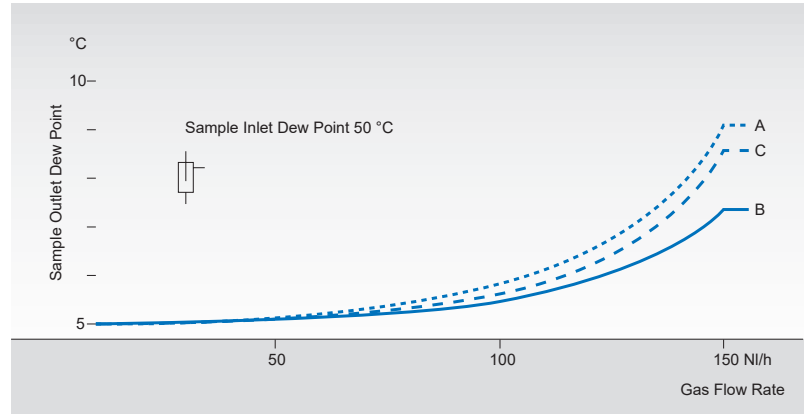
- 1 Heated filter sample probe SP210-H or SP2000-H
- 2 Heated sample line 4M4/6
- 3 Cooler ECP1000
- 4 3-way ball valve 3L/PV-1
- 5 Peristaltic pump SR25.2
- 6 Diaphragm pump MP47 or MP06/12 or N5KP
- 7 Fine filter FP-2T-D with liquid alarm LA1
- 8 Aerosol filter CLF-5/W optional according to application
- 9 Flow meter FM10 or FM40, 25-250 NI/h
- 10 Analyzers e.g. PMA1000



ECP 1000

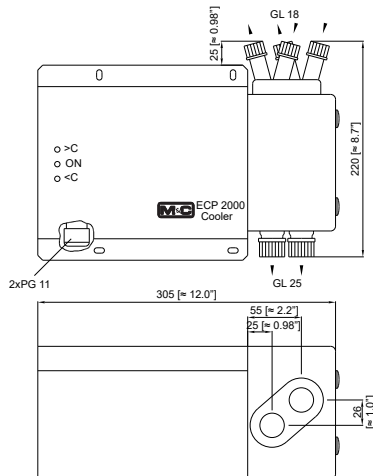


ECP 1000

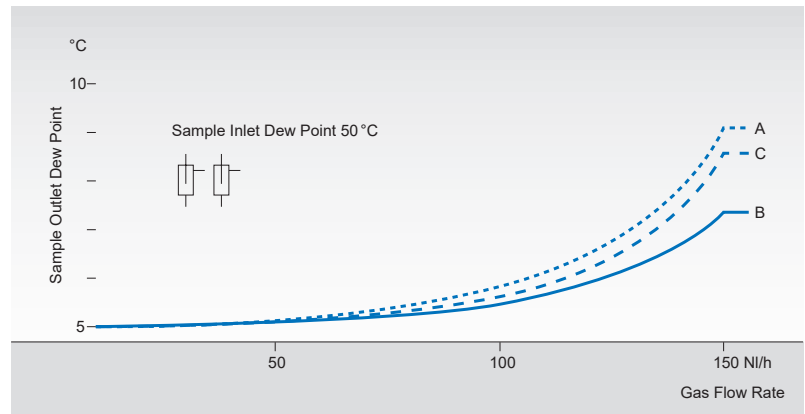


Gas cooler with	Part No.
A Heat exchanger out of glass	01K1000
B Heat exchanger out of SS 316Ti	01K2000
C Heat exchanger out of PVDF	01K3000

ECP 2000

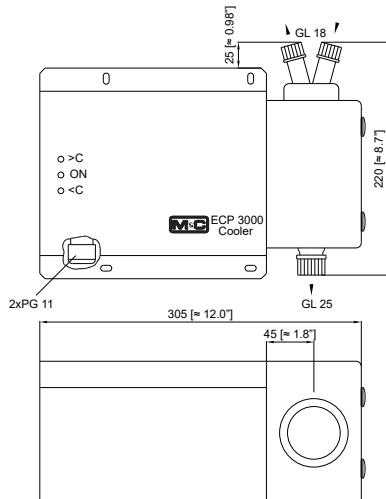


ECP 2000

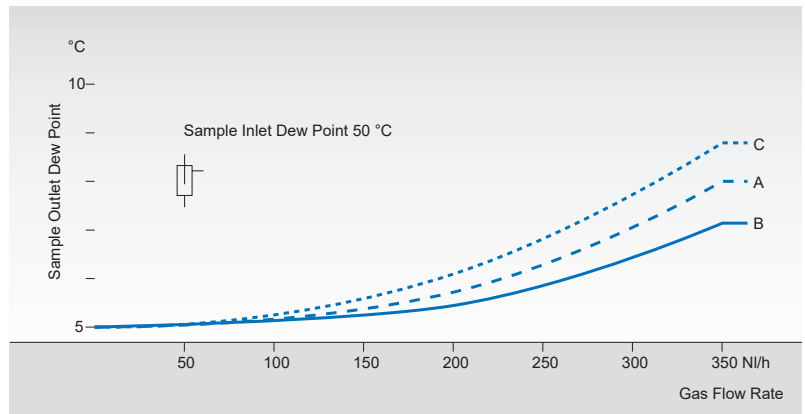


Gas cooler with	Part No.
A Heat exchanger out of glass	01K2100
B Heat exchanger out of SS 316Ti	01K2200
C Heat exchanger out of PVDF	01K2300

ECP 3000



ECP 3000



Gas cooler with	Part No.
A Heat exchanger out of glass	01K3100
B Heat exchanger out of SS316Ti	01K3200
C Heat exchanger out of PVDF	01K3300

Dimensions in mm (inches)

Gas Cooler Series EC*	ECP 1000	ECP 2000	ECP 3000
Part No. with Duran glass® heat exchanger	01K1000	01K2100	01K3100
Part No. with stainl. steel heat exchanger	01K2000	01K2200	01K3200
Part No. with PVDF heat exchanger	01K3000	01K2300	01K3300
Number of heat exchangers	1	2	1
Gas flow rate heat exchanger	Max. 150 NI/h** [2.5 LPM]**	2 x max. 150 NI/h** [2.5 LPM]**	Max. 350 NI/h** [5.8 LPM]**
Ambient temperature	+5 to +45 °C [41 °F to 113 °F], +50 °C* [122 °F]*	+5 to +50 °C [41 to 122 °F]	+5 to +50 °C [41 to 122 °F]
Storage temperature	-20 °C to +60 °C [-4 to 140 °F]		
Sample outlet dew point	Range of adjustment: +2 to +15 °C [35.6 to 59 °F], factory setting: +5 °C [41 °F]		
Dew point stability	±0.1 °C [±0.18 °F] at constant conditions		
Sample inlet temperature	Max. 180 °C [356 °F]**		
Sample inlet dew point	Max. 80 °C [176 °F]**		
Total cooling power at +25 °C [77 °F] ambient	50 kJ/h	90 kJ/h	90 kJ/h
Stagnant space heat exchanger	50 ml	2 x 50 ml	100 ml
Δ P per heat exchanger	1 mbar at 150 NI/h	1 mbar at 150 NI/h	5 mbar at 350 NI/h
Power consumption	115 VA	115 VA	115 VA
Main connection	230 V ±10 %, 50 Hz or 115 V ± 10 %, 60 Hz		
Ready for use	< 10 min.		
Electrical connection	Terminals 2.5 mm ² , cable gland 2 x M16		
Status alarm: 2 changeover contacts	Contact rating: 250 V, 2 A, 500 VA, 50 W, alarm point: Δ T ±3 °C zu T _{SET}		
Case protection	IP20; EN 60529		
Electrical standard	EN 61010		
Case colour	RAL 9005		
Method of mounting	Wall-mount		
Dimensions [W x H x D]	275 x 22 x 136 mm [≈ 10.8" x 8.7" x 5.4"]	305 x 220 x 136 mm [≈ 12.0" x 8.7" x 5.4"]	
Weight	5.5 kg [≈ 12.1 lbs]	7 kg [≈ 15.4 lbs]	7 kg [≈ 15.4 lbs]

* Option

** Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature and an outlet dew point of 5 °C [41 °F].

Material of heat exchanger	Duran glass®	PVDF	SS 316Ti
Admissible gas pressure, max - bar abs.	3 ¹⁾ /2 ²⁾	3/2 ²⁾	10/2 ²⁾
Sample gas connection	For tube ø 6 mm, 8 oder 10 mm*	G 1/4" i	G 1/4" i, NPT*
Condensate connection	For tube ø 12 mm 10 oder 8 mm*	G 3/8" i	G 3/8" i, NPT*

* Option

1) With GL adapter

2) Max. 2 bar abs. with peristaltic pump SR25.1

For GL adapters and tube fittings to connect different tube diameters at the heat exchanger, see data sheets "Fittings for GL Glass Connections" and "Flexible and rigid tube fittings, plugs and connectors with barbed fitting".

Duran® is a brand name for borosilicate glass produced by the German company DURAN Group GmbH



ECP20-2G

Peltier Gas Cooler Series ECP®

Version ECP20-2 for 1 x 500 NI/h gas flow rate

Special Features

- Peltier gas cooler with 2 Jet-Stream heat exchangers (available in various standard materials)
- Gas flow rate max. 500 NI/h
- Gas outlet dew point adjustable from +2 to +15 °C [35.6 to 59 °F]
- Dew point stability < ±0.1 °C [< ±0.18 °F]
- Total cooling capacity of 80 kJ/h at +25 °C [+77 °F] ambient temperature
- Ambient temperature up to +45 °C [+113 °F]
- Status alarm standard
- Compact design
- Low weight
- Power: 115/230 V switchable

Application

The M&C gas cooler ECP20-2 is used in analytical technology to lower the dew point of humid gases in order to exclude condensation in the analyzer. By setting an extremely stable gas outlet dew point, water vapor cross-sensitivity and volumetric errors are avoided.

Description

The electronically controlled Peltier gas coolers and the special design of the Jet-Stream heat exchangers ensure optimum dew point reduction to a low, stable value and reliable condensate separation.

External condensate pre-separation is not required under normal conditions.

The condensate is discharged externally by using peristaltic pumps, condensate float traps or collecting vessels. The practical design allows the installation of heat exchangers made of a wide variety of materials, depending on the application. LEDs signal the operating status as well as under- and overtemperature.

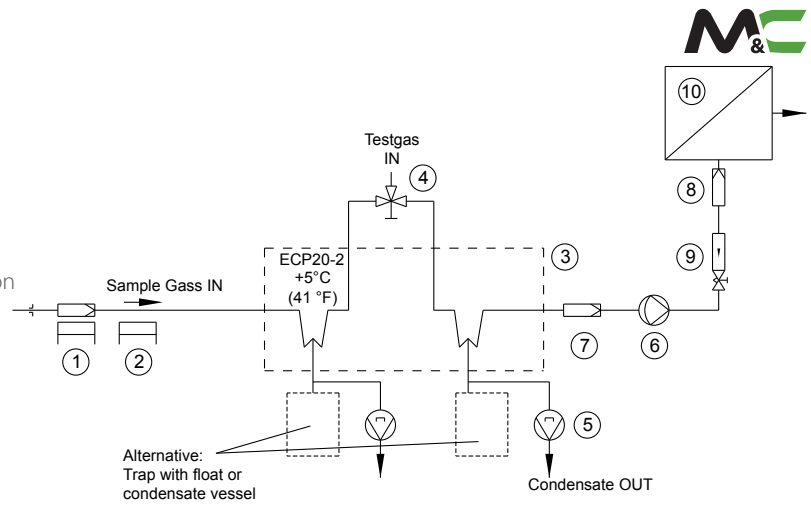
An alarm function is triggered at a temperature deviation of ±3 °C [±5.4 °F].

The ECP20-2 gas cooler is equipped with two EC jet stream heat exchangers for a max. flow rate of 500 NI/h. The first heat exchanger is used as an uncontrolled pre-cooling system and the second as a controlled main cooling system.

Due to the compact and lightweight design as well as a very fast operational readiness, it is particularly suitable for portable and stationary gas conditioning systems. The gas coolers operate self-monitoring and maintenance-free.

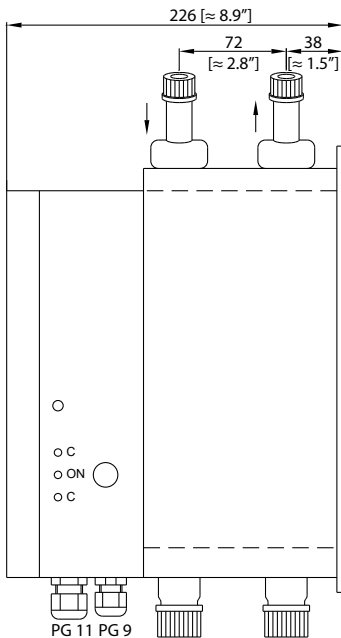
Example application for ECP20-2

- 1 Heated filter sample probe SP2000-H
- 2 Heated sample line 4M4/6
- 3 Cooler ECP20-2
- 4 3-way ball valves 3L/PV-1
- 5 Peristaltic pumps SR25.1
- 6 Diaphragm pump MP47
- 7 Fine filter FP-2T-D with liquid alarm LA1
- 8 Aerosol filter CLF-5/W optionally according to application
- 9 Flow meter FM10, 50-500 NI/h
- 10 Analyzer, e.g. PMA1000



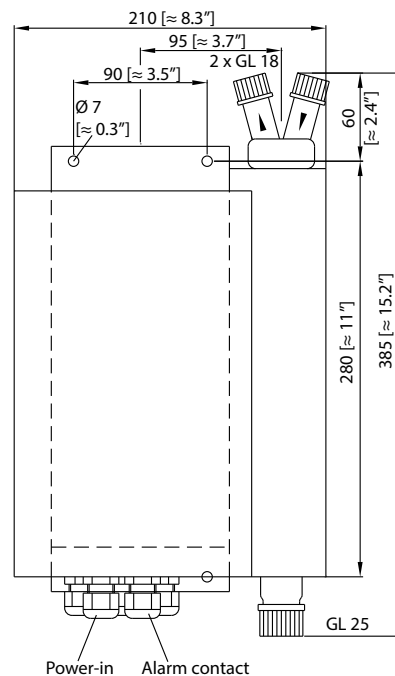
Dimensions ECP20-2

Side view

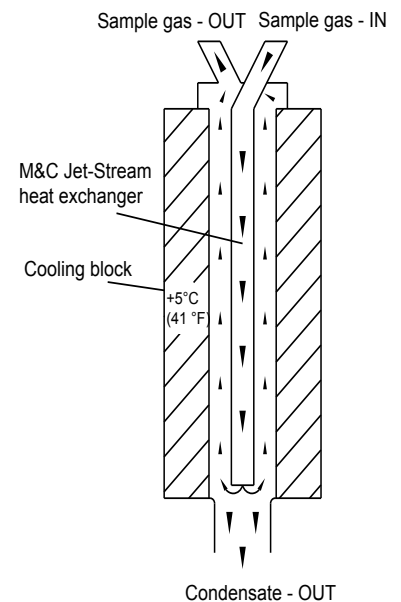


Dimensions in mm [Inches]

Front view



Functioning diagram of M&C heat exchanger

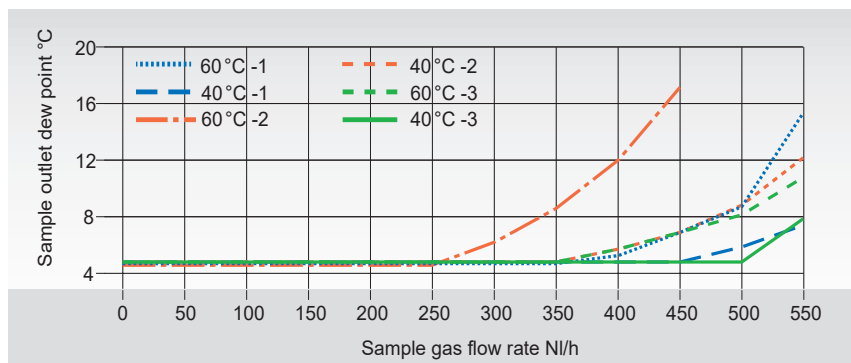


Sample outlet dew point difference

for the gas cooler ECP20-2 with heat exchangers out of:

- 1 Glass
- 2 PVDF
- 3 Stainless steel 316Ti

depending on gas flow rate, and depending on a sample inlet dew point of 40 °C [104 °F] or 60 °C [140 °F], at 25 °C [77 °F] ambient temperature.



Gas Cooler Series ECP*	ECP20-2		
Part No. Gas Cooler ECP20-2	01K8100	01K8140	01K8120
Material of heat exchanger	Duran glass®	PVDF	SS 316Ti
Gas pressure max.-bar abs. ²⁾ with GL adapter	2/3 ²⁾	3	10**
Sample gas connection	For ø 6 mm o.d. tube G 1/4" female		
Condensate connection	For ø 12 mm o.d. tube G 3/8" female		
ΔP at 500 NI/h flow rate	5 mbar		
Stagnant space per heat exchanger	Approximately 70 ml		
Gas stream/gas flow rate*	1 x max. 500 NI/h		
Ambient temperature*	+5 to +45 °C [41 to 113 °F]		
Storage temperature	-20 to +60 °C [-4 to 140 °F]		
Sample outlet dew point	Range of adjustment: +2 to +15 °C [35.6 to 59 °F], factory setting: +5 [41 °F]		
Dew point stability	At constant conditions < ±0.1 °C [< ±0.18 °F]		
Sample inlet temperature*	Max. 180 °C [356 °F]		
Sample inlet dew point*	Max. 80 °C [176 °F]		
Total cooling capacity at +25 °C [77 °F] ambient	80 kJ/h		
Main power connection/power consumption	230 V/50 Hz or 115 V/60 Hz switchable, 250 VA		
Ready for operating	< 20 min.		
Electrical connection	Terminals 2.5 mm ² , 2 x PG11 cable gland		
Status alarm 1 changeover contact, potential-free	Contact rating 250 V, 2 A, 500 VA, 50 W alarm point: Δ ±3 °C [±5.4 °F] to T _{SET}		
Case protection/electrical standard	IP54 EN 60529/EN 61010		
Method of mounting/case color	Wall-mounting/case color black		
Dimensions (W x H x D)	210 x 385 x 226 mm [≈ 8.3" x 15.2" x 8.9"]		
Weight	12.5 kg [≈ 27.6 lbs]		

* Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature and an outlet dew point of 5 °C [41 °F].

** Other versions on request.

²⁾ GL adapter and tube fittings for the connection of different tube diameters at the heat exchanger see data sheets "Fittings for GL Glass Connections" and "Flexible and rigid tube fittings, plugs and connectors with barbed fitting".

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

Duran® is a brand name for borosilicate glass produced by the German company Duran Group GmbH.



ECP2000C with two SR25.2-W peristaltic pumps

Peltier Gas Cooler Series ECP®

Version ECP1000C with 1 x 150 NI/h

Version ECP2000C with 2 x 150 NI/h

Version ECP3000C with 1 x 350 NI/h

Special Features

- Ambient temperature from +5 to +50 °C [41 to 122 °F] (no extra charge)
- Outlet dew point adjustable from +2 to +15 °C [35.6 °F to 59 °F]
- Dew point stability ± 0.1 °C [± 0.18 °F]
- Control setpoint selectable between: absolute value mode or ΔT mode
- Optional measurement of the gas outlet temperature in the gas path
- Ready for use in less than 3 minutes
- Option: configurable mA output (no shielding necessary)
- Integrated evaluation for liquid alarm sensors type LA1 or LA1S
- Configurable, potential-free alarm output
- Universal power supply
- Mounting option for up to two SR25.2-W peristaltic pumps below the unit
- Compact design, low weight
- Jet-Stream heat exchangers available in various materials
- Compatible with previous version

Application

The M&C gas coolers of the ECP® series are used in analytical technology to reduce the dew point of humid gases in order to prevent condensation in the analyzer. By setting an extremely stable gas outlet dew point, water vapor cross-sensitivities and volumetric errors are minimized.

The compact, lightweight design makes the ECPX000C units particularly suitable for portable and compact stationary gas conditioning systems.

Description

With the upgraded version ECPX000C, M&C combines the solid advantages of the ECPX000 devices with new future-oriented features, a significant increase in cooling capacity, more functions and improved service friendliness.

The ECPX000C gas cooler can be operated at ambient temperatures of up to 50 °C [122 °F] as standard.

It is characterized by a very high dew point stability of $< \pm 0.1$ °C [± 0.18 °F].

The broadband power supply makes the cooler universally usable. Plug-in electrical connections for power and alarm relays are standard. The connections of the configurable mA outputs (optional) are also supplied as plug-in versions.

The ECPX000C is equipped with a wear-free, capacitive control and display panel for improved handling of the cooler.

The absolute value control implemented by the previous ECPX000 version has been extended by the differential temperature mode.

The cooling capacity has almost doubled compared to the previous version. The ECPX000C gas cooler is ready for use in less than 3 minutes under normal operating conditions.

The housings of the three ECPX000C devices have the same compact dimensions and are compatible with previous versions.

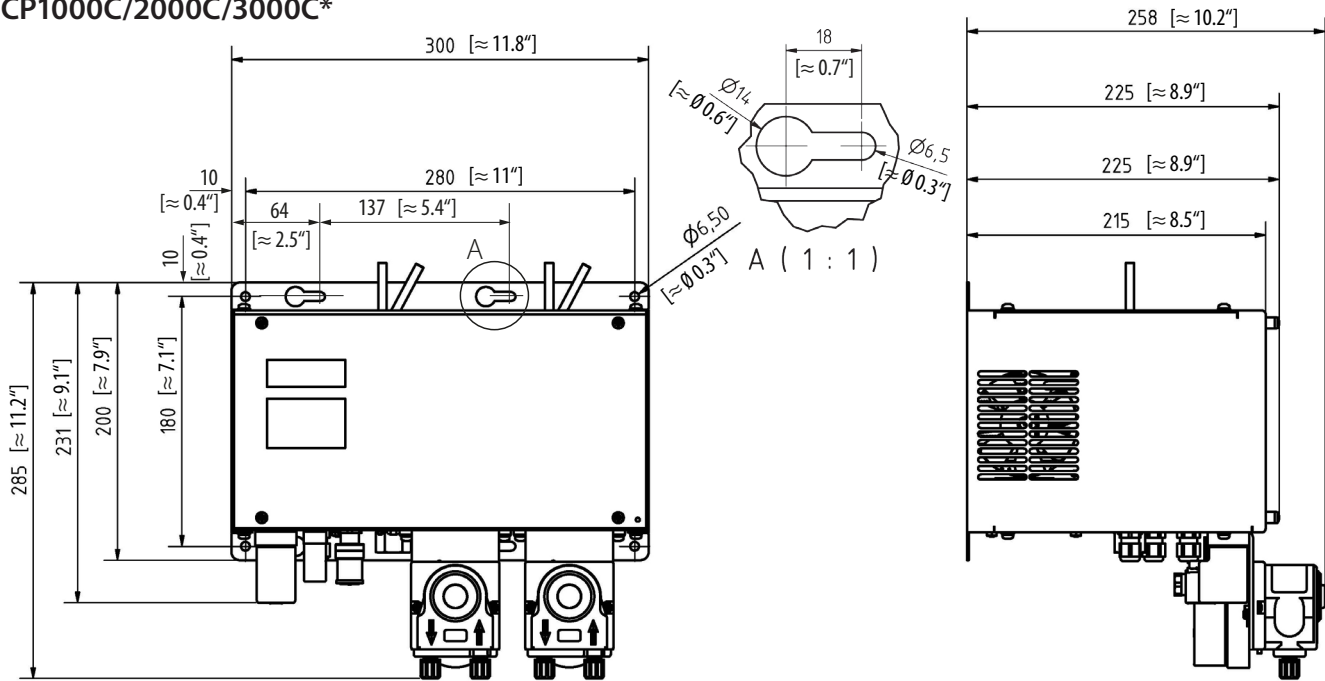
The units can be opened from the front for easier maintenance.

The condensate can be discharged externally by peristaltic pumps, traps or collecting vessels. Up to two peristaltic pumps for condensate removal can be mounted directly below the unit.

Dimensions



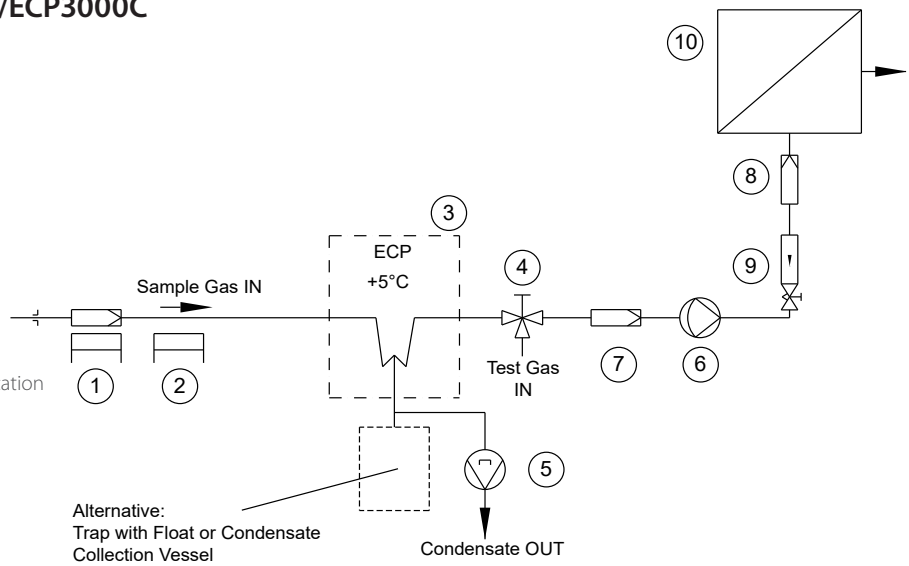
ECP1000C/2000C/3000C*



* Drawing shows ECP2000C with two optional SR25.2-W peristaltic pumps
Dimensions in mm [inches]

Application example for ECP1000C/ECP3000C

- 1 Gas sample probe SP180-H or SP2000-H
- 2 Heated sample line 4M4/6
- 3 Gas cooler ECP1000C/ECP3000C
- 4 3-way ball valve 3L/PV-1
- 5 Peristaltic pump SR25.2-W
- 6 Diaphragm pump MPF-05 or MP06/12 or N5KP
- 7 Universal filter FP-2T-D with liquid alarm type LA1
- 8 Aerosol filter CLF-5/W optional according to application
- 9 Flow meter FM10 or FM40, 25-250 NI/h
- 10 Analyzers e.g. GENTWO PMA1000 V2.2



Technical Data

Gas Cooler Series EC*	ECP1000C	ECP2000C	ECP3000C
Part No. without heat exchangers	01K1400x	01K2400x	01K3400x
Number of possible heat exchangers	1	2	1
Gas flow rate per heat exchanger	Max. 150 NI/h*	2 x max. 150 NI/h*	Max. 350 NI/h*
Ambient temperature	+5 to +50 °C [41 to 122 °F]		
Storage temperature	-20 to +60 °C [-4 to 140 °F]		
Sample outlet dew point	Range of adjustment: +2 to +15 °C [35.6 to 59 °F], factory setting: +5 °C [41 °F]		
Dew point stability	±0.1 °C [±0.18 °F] at constant conditions		
Sample inlet temperature	Max. 180 °C [356 °F]*		
Gas inlet water vapor saturation	Max. 80 °C [176 °F]*		
Total cooling capacity at +25 °C ambient	110 kJ/h	2 x 90 kJ/h	110 kJ/h
Δ P per heat exchanger at	1 mbar at 150 NI/h	1 mbar at 150 NI/h	5 mbar at 350 NI/h
Stagnant space per heat exchanger	50 ml	2 x 50 ml	100 ml
Power consumption	150 VA	275 VA	150 VA
Power supply	115 - 230 V AC ±10 %, 50/60 Hz		

Gas Cooler Series EC*	ECP1000C	ECP2000C	ECP3000C
Part No. without heat exchangers	01K1400x	01K2400x	01K3400x
Ready for use	< 3 min. (at 25 °C [77 °F] ambient temperature and with no load applied)		
Max. loudness	58 dBA		
Electrical connection	Power: pluggable via solenoid valve plug type A Alarm relay: pluggable via solenoid valve plug type B mA: when purchasing the mA option, pluggable via Phoenix circular connector 1681101		
Signal input and output	One mA output per channel possible (no shielding required) One M&C LA liquid alarm sensor type LA1 or LA1S can be connected per channel. The evaluation is integrated as standard.		
Status alarm: 2 changeover contacts	Contact rating: 250 V, 2 A, 500 VA, 50 W		
Case protection	IP20; EN 60529		
Electrical standard	EN 61010		
EMC standard	EN 61326		
Case color	RAL 9003		
Method of mounting	Wall-mount		
Case dimensions (W x H x D)	300 x 200 x 225 mm [≈ 11.8" x 7.9" x 8.9"]		
Weight without heat exchangers	6.5 kg [≈ 14.3 lbs.]	8.2 kg [≈ 18.1 lbs.]	6.7 kg [≈ 14.8 lbs.]

* Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature and an outlet dew point of 5 °C [41 °F]. Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

Heat Exchanger Options

Gas Cooler Series ECP®	ECP1000C/ECP2000C				
Heat exchanger type	ECM-2/ ECP(1/2)000C/ ECC-1 G, WT	ECM-2/ ECP(1/2)000C/ ECC-1 PV, WT	ECM-2/ ECP(1/2)000C/ ECC-1 SS, WT	ECM-2/ ECP(1/2)000C/ ECC-1 SS/NPT, WT	ECM-2/ ECP(1/2)000C/ ECC-1 G/GL14, WT
Part No.	97K0100	97K0110	97K0115	97K0115NN	97K0101
Material of heat exchanger	DURAN® glass	PVDF	SS 316Ti	SS 316Ti	DURAN® glass
Admissible gas pressure	Max. 3 bar abs. ¹⁾ (2 bar abs. ²⁾)	Max. 3 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)	Max. 3 bar abs. ¹⁾ (2 bar abs. ²⁾)
Sample gas connection	GL 18 for tube Ø 6 mm OD	Tube Ø 6 mm	Tube Ø 6 mm	1/4" tube	GL 18 for tube Ø 6 mm OD; GL 14 for sensor
Condensate connection	GL 25 for tube Ø 12 mm, Ø 8 mm* or Ø 10 mm*	G 3/8"i	G 3/8"i	3/8" NPT	GL 25 for tube Ø 12 mm, Ø 8 mm* or Ø 10 mm*

Gas Cooler Series ECP®	ECP3000C			
Heat exchanger type	ECM-1/ECP3000(C)/ ECC-1 G, WT	ECM-1/ECP3000(C)/ ECC-1 PV, WT	ECM-1/ECP3000(C)/ ECC-1 SS, WT	ECM-1/ECP3000(C)/ ECC-1 SS/NPT, WT
Part No.	93K0140	93K0170	93K0160	93K0160N
Material of heat exchanger	DURAN® glass	PVDF	SS 316Ti	SS 316Ti
Admissible gas pressure	Max. 3 bar abs. ¹⁾ (2 bar abs. ²⁾)	Max. 3 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)
Sample gas connection	GL 18 for tube Ø 6 mm OD	G 1/4" i	G 1/4" i	1/4" NPT
Condensate connection	GL 25 for tube Ø 12 mm, Ø 8 mm* or Ø 10 mm*	G 3/8" i	G 3/8" i	3/8" NPT

* Optional

¹⁾ With GL adapter

²⁾ With peristaltic pump SR25.2-W

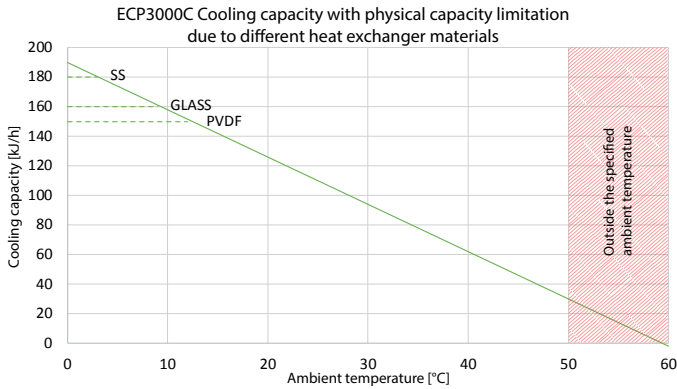
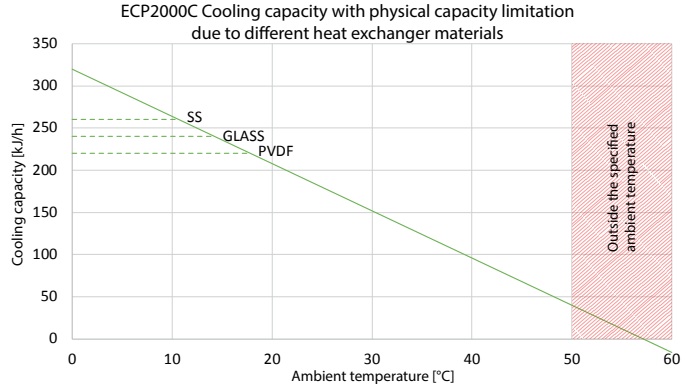
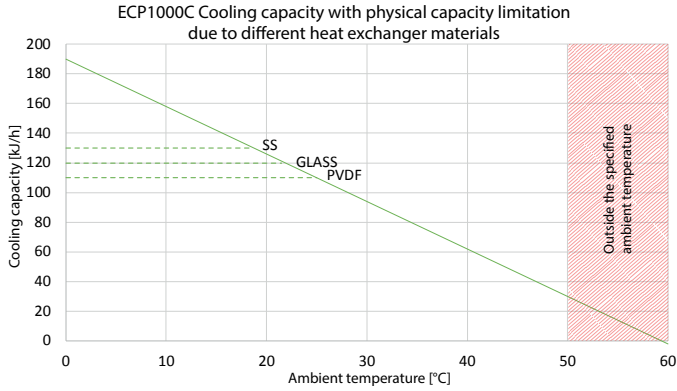
GL adapter and tube fittings for the connection of different tube diameters at the heat exchanger, see data sheets "Fittings for GL Glass Connections" and "Flexible and rigid tube fittings, plugs and connectors with barbed fitting".

DURAN® is a brand name for borosilicate glass produced by the German company DURAN Group GmbH.

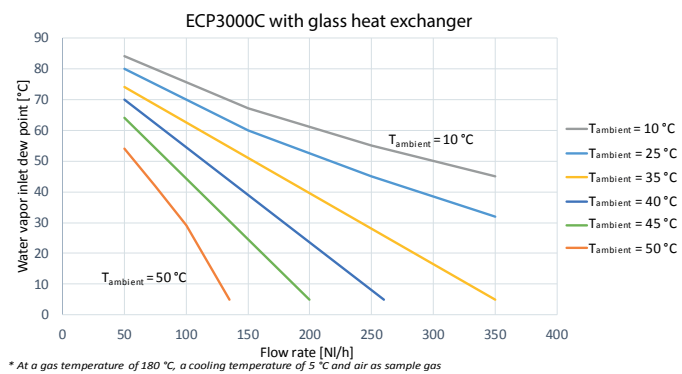
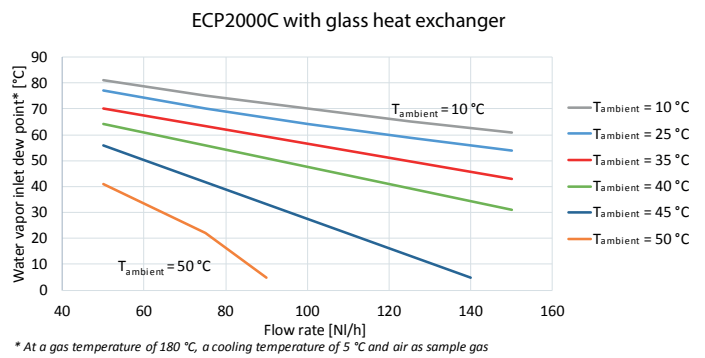
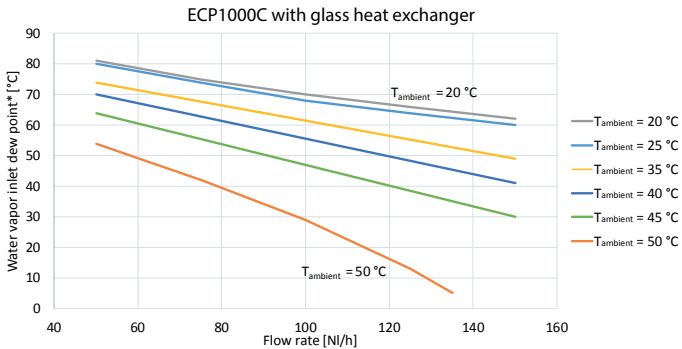
More Options

Options für ECPX000C	
Part No. 01K9200	1 x mA output incl. plug and socket, mounting and calibration (per channel)
Part No. 01K9250	1 x thermocouple incl. plug, socket, signal converter and mounting incl. special heat exchanger with three gas connections (ECP1000C only)
Part No. 01K9260	Type LA1S: Liquid alarm sensor with cable break detection Note: Evaluation is carried out as standard in the ECPX000C, LA1S for M&C universal filters with D connection
Part No. 01K9270	Type LA1: Liquid alarm sensor without cable break detection Note: Evaluation is carried out as standard in the ECPX000C, LA1 for M&C universal filters with D connection
Part No. 01P1307	Peristaltic pump SR25.2-W, 0.3 NI/h, 115/230 V AC with PVDF tube connection fitting DN 4/6 mm
Part No. 01P9160X	SR25.2-W Connection set without peristaltic pump (PVDF screw connections for SS 316Ti, PVDF and glass HE, 0.5 m Novoprene hose and fixing screws)

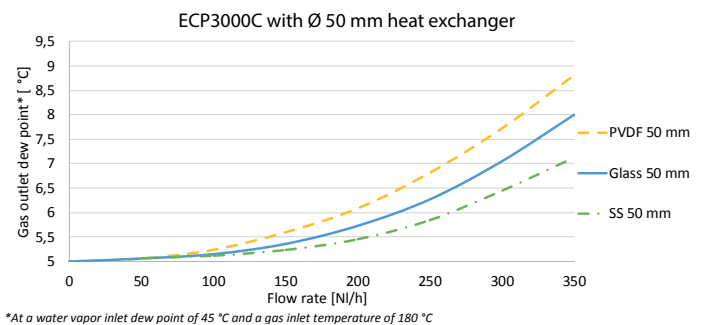
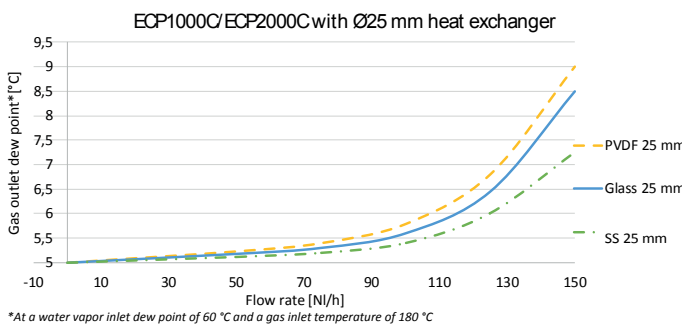
Cooling Capacity



Maximum Inlet Dew Point



Gas Outlet Dew Point





EC-EX

Gas Cooler Series EC®

Version ECS and EC-EX
for 4 x 250 NI/h

Special Features

- **Jet-Stream heat exchangers in 3 standard materials**
- **Ambient temperature up to 50 °C [122 °F]**
- **Outlet dew point adjustable from 2 to 7 °C [35.6 to 44.6 °F]**
- **Dew point stability < ±0.25 °C [$< \pm 0.45$ °F]**
- **Status alarm contact standard**
- **High reliability**
- **Self-monitoring**
- **ATEX certified versions for hazardous zone 1 areas**
- **100 % CFC-free**

Application

ECS and EC-EX gas coolers are used in gas analysis systems to lower the dew point of humid gases in order to avoid condensation in the analyzer. An extremely stable gas dew point prevents water vapour cross-sensitivity and volumetric errors.

Description

The electronically controlled compressor cooling system and the special design of the Jet-Stream heat exchangers guarantee optimum dew point reduction to a low, stable value and safe condensate separation. No external pre-draining is needed.

Up to 4 peristaltic pumps can be installed in the ECS to drain condensate. Otherwise, the condensate must be removed with traps or collected in vessels.

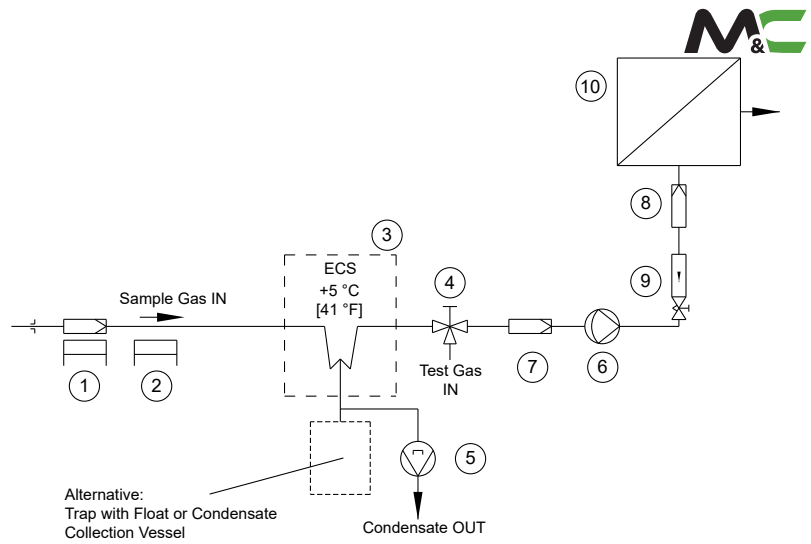
An EC-F fan unit for ambient temperatures > 40 °C [104 °F] with additional fans for forced ventilation of the cooler and condensate drainage is offered as a subassembly to the ECS.

The new design enables up to 4 heat exchangers to be integrated either at the factory or later, without any problems. They can be connected in series or parallel. Heat exchangers are available in various materials depending on the application.

LEDs indicate the operating conditions as well as high and low temperatures. A temperature deviation of ±3 °C [±5.4 °F] triggers an alarm. The gas coolers are self-monitoring in operation and require only minimum maintenance.

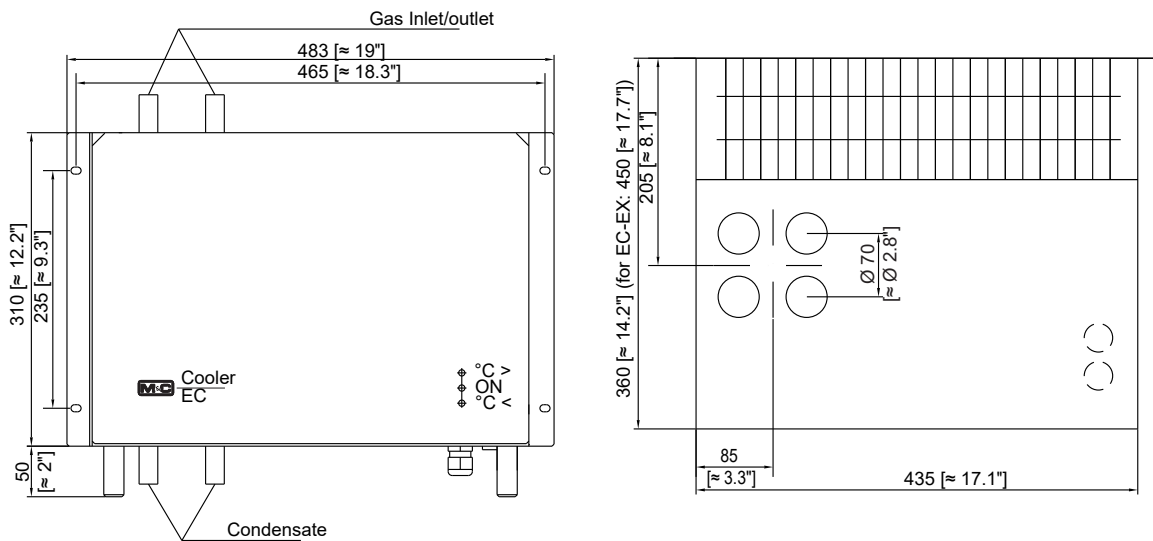
Application example for ECS

- 1 Heated gas sample probe SP210-H or SP2000-H
- 2 Heated sample line 4M4/6
- 3 Gas cooler ECS
- 4 3-way ball valve 3L/PV-1
- 5 Peristaltic pump SR25.2
- 6 Diaphragm pump MP47 or MP06/12 or N5KP
- 7 Fine filter FP-2T-D with liquid alarm LA1
- 8 Aerosol filter CLF-5/W optional according to application
- 9 Flow meter FM10 or FM40, 25-250 NI/h
- 10 Analyzers e.g. PMA1000



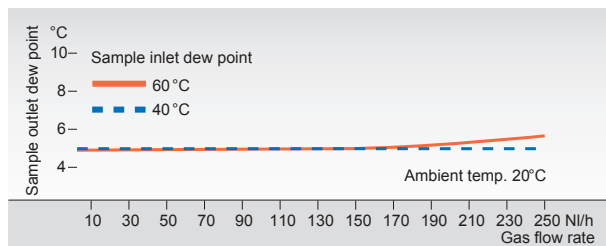
Dimensions

Gas cooler ECS/EC-EX

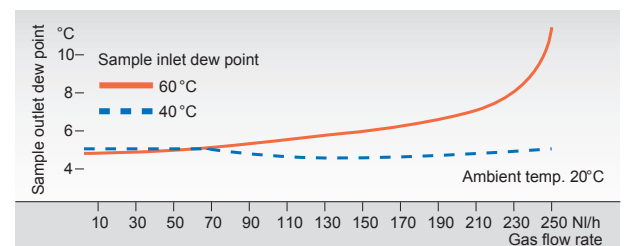


Dimensions in mm [Inches]

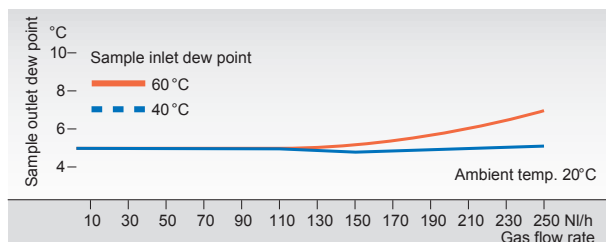
Cooler type EC-G with heat exchanger out of glass



Cooler type EC-PV with heat exchanger out of PVDF



Cooler type EC-SS with heat exchanger out of SS316Ti



Technical Data

Gas Cooler Series EC®	ECS	EC-EX
Part No. without heat exchanger	02K1500X(a)	02K5000X(a)
Part No. with glass heat exchanger	02K1500(a)	02K5000(a)
Part No. with stainl. steel heat exchanger	02K2500(a)	02K5010(a)
Part No. with PVDF heat exchanger	02K3500(a)	02K5020(a)
Number of heat exchanger(s)	Optional up to 4 (ECS unit with 6 heat exchangers available on request)	Optional up to 4
Gas flow rate per heat exchange	250 NI/h**	
Ambient temperature	+5 to 45 °C [41 to 113 °F], with option EC-F = +5 to 50 °C [41 to 122 °F]	+5 to 45 °C [41 to 113 °F]
Storage temperature	-20 to +60 °C [-4 to 140 °F]	
Sample outlet dew point	Range of adjustment: +2 °C [35.6 °F] to +7 °C [44.6 °F], factory setting: +5 °C [41 °F]	
Dew point stability	At constant conditions < ±0.25 °C [< ±0.45 °F]	
Sample inlet temperature	Max. 180 °C [356 °F]**	
Sample inlet dew point	Max. 80 °C [176 °F]**	
Total cooling power	Max. 520 kJ/h at 25 °C [77 °F] ambient temperature	
Power consumption	280 VA, start up current at 230 V= 7.9 A	
Mains connection	230 V ±10 %, 50 Hz, optional 115 V ±10 %, 50-60 Hz	230 V ±10 %, 50 Hz, optional 115 V ±10 %, 50-60 Hz
Ready for operation	< 30 min.	
Electrical connection	2.5 mm ² terminals	
Status alarm: ECS 2 changeover contacts	Contact rating: 250 V, 2 A, 500 VA, 50 W, alarm point: ΔT ±3 °C [±5.4 °F] to T _{SET}	
Status alarm: EC-EX 1 changeover contact	Contact rating: 220 V, 2 A, 100 VA, 50 W, alarm point: ΔT ±3 °C [±5.4 °F] to T _{SET}	
Type of housing protection	IP20; EN 60529	
Electrical standard/certificate No.	EN 61010	II 2G Ex pxb db eb q [ib] IIC T4 Gb (Certificate No. BVS 17 ATEX E 080) Starting from serial No. 1904XXXX: Ex pxb db eb q [ib] IIC T4 Gb (Certificate No. IECEx BVS 18.0021)
Case color	RAL 9003	
Method of mounting	19"-rack or wall mounting	
Dimensions (W x H x D)	84 HP x 7U x 360 mm [≈ 14.2"]	84 HP x 7U x 450 mm [≈ 17.7"]
Weight	31 kg [≈ 68 lbs]	40 kg [≈ 88 lbs]

Options

Heat exchanger versions

Heat exchanger material	Duran® glass	PVDF	Stainless steel 316Ti
Part No.	02K9100	02K9300	02K9200
Admissible gas pressure bar g	3 ²⁾ / 2 ³⁾	3 / 2 ³⁾	10 bar
Sample gas connection	GL 18-6 ø 6 mm 8 o. 10 mm*	G 1/4" female	G 1/4" female, NPT*
Condensate connection	GL 25-12 ø 12 mm 10 o. 8 mm*	G 3/8" female	G 3/8" female, NPT*
ΔP per heat exchanger at 300 NI/h	1 mbar		
Dead volume per heat exchanger	70 ml		

* Optional

** Maximum values in technical data must be rated in consideration of the total cooling capacity at 25 °C [77 °F] ambient temperature and an outlet dew point of 5 °C [41 °F].

1) Others upon request.

2) With GL connection adapter.

3) With SR25.2 max. 2 bar abs.

(a) Addition to part number for 115 V version

GL adapters and tube fittings to connect different tube diameters at the heat exchanger see data sheets "Fittings for GL Glass Connections" and "Flexible and rigid tube fittings, plugs and connectors with barbed fitting".

Duran® is a registered trade mark for borosilicate glass produced by the company DWK Life Sciences GmbH, Germany.

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

Type	Part No.	Gas cooler in wall-mounting housing ¹⁾
ECS-1-G	02K1500	Gas cooler with 1 x heat exchanger out of Duran® glass, depth of housing 360 mm [≈ 14.2"], 230 V, 50 Hz
ECS-1-SS	02K2500	Gas cooler with 1 x heat exchanger out of stainless steel, depth of housing 360 mm [≈ 14.2"], 230 V, 50 Hz
ECS-1-PV	02K3500	Gas cooler with 1 x heat exchanger out of PVDF, depth of housing 360 mm [≈ 14.2"], 230 V, 50 Hz
/115V	02K...A	Power EC/ECS 115 V 60 Hz
EC-EX-1G	02K5000	Gas cooler with 1 x heat exchanger out of Duran® glass, depth of housing 450 mm [≈ 17.7"], 230 V, 50 Hz, Ex version
EC-EX-1SS	02K5010	Gas cooler with 1 x heat exchanger out of stainless steel, depth of housing 450 mm [≈ 17.7"], 230 V, 50 Hz, Ex version
EC-EX-1PV	02K5020	Gas cooler with 1 x heat exchanger out of PVDF, depth of housing 450 mm [≈ 17.7"], 230 V, 50 Hz, Ex version
/115V	02K...A	Power EC-EX 115 V 60 Hz

Additional heat exchangers installed

EC-G	02K9100	1 x Jet-Stream heat exchanger out of Duran® glass
EC-G-90°	02K9150	1 x Jet-Stream heat exchanger out of Duran® glass with 90° bend at the gas connectors
EC-SS	02K9200	1 x Jet-Stream heat exchanger out of stainless steel 316Ti
EC-PV	02K9300	1 x Jet-Stream heat exchanger out of PVDF

Options

/PT 100	02K9500	PT 100 Sensor integrated in cooling block of EC/ECS for external temperature controlling
EC-F*	02K9530	Universal unit with 2 fans and dust filter for mounting under EC/ECS cooler, completely assembled, 230 V, 50 Hz or 115 V, 60 Hz, not available for EC-EX
/SR25.2	01P9140	Extra charge for 1 pc. peristaltic pump SR25.2 integrated in the front plate of the cooler, compl. installed, cooler weight plus 0.6 kg [≈ 1.3 lbs] per pump, up to 4 pumps

1) 19"- housing on request - please indicate in your order

* Separate data sheets for the EC-F unit, peristaltic pumps, collecting vessels and fittings are available on www.mc-techgroup.com.

Order example:

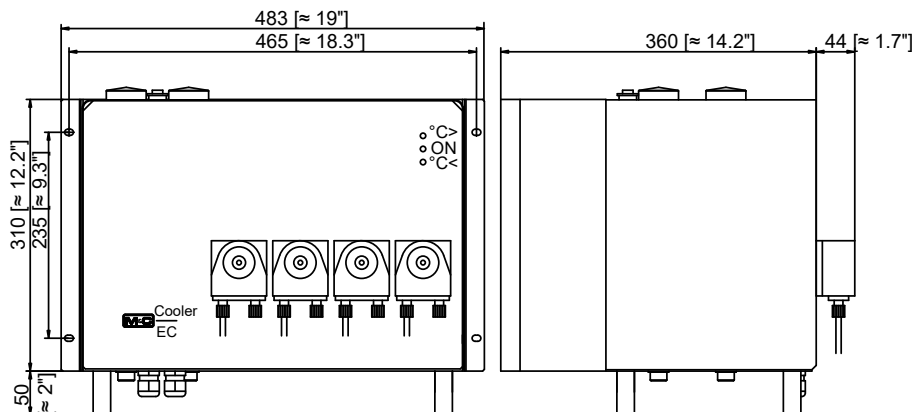
1 x Gas cooler ECS, power 115 V 60 Hz, with 4 x glass heat exchangers and 4 x peristaltic pumps; Part Numbers.

1 x 02K1500Xa (ECS without heat exchanger)

4 x 02K9100 (glass heat exchanger)

4 x 01P9140 (peristaltic pump SR25.2)

Gas cooler ECS with SR25.2 integrated in the front plate of the cooler



Dimensions in mm [Inches]



EC-F, EC-FD

Universal Unit Series EC®

Versions EC-F, EC-FD, EC-D

Special Features

- **EC-F unit for forced ventilation of the EC/ECS gas cooler at higher ambient temperatures**
- **EC-FD unit for forced ventilation of the EC/ECS gas cooler plus automatic condensate drainage**
- **Including ambient air dust filter pad**
- **EC-D unit for automatic condensate drainage**
- **Compact design**
- **Minimum maintenance**
- **Exclusively factory-assembled under gas coolers EC, ECS**

Application

The M&C gas cooler EC/ECS is used in gas analysis to lower the dew point of humid gas in order to prevent condensation in the analyzer.

With higher ambient temperatures or in case of gas conditioning systems in a protective housing with low ventilation, it is often necessary to mount an EC-F or EC-FD universal unit under the gas cooler EC/ECS for adequate forced ventilation.

For automatic condensate drainage, the universal units EC-FD and EC-D equipped with up to 4 peristaltic pumps SR25.1 are mounted under the EC cooler in a compact and service-friendly manner.

Description

The M&C universal unit EC-F is equipped with 2 fans and an ambient air dust filter pad, which can be easily replaced in a drawer, for forced ventilation of the EC cooler .

The universal unit EC-FD is also equipped with 2 fans and an ambient air dust filter pad, which can be easily replaced in a drawer, and can be supplied with up to 4 peristaltic pumps for automatic condensate drainage.

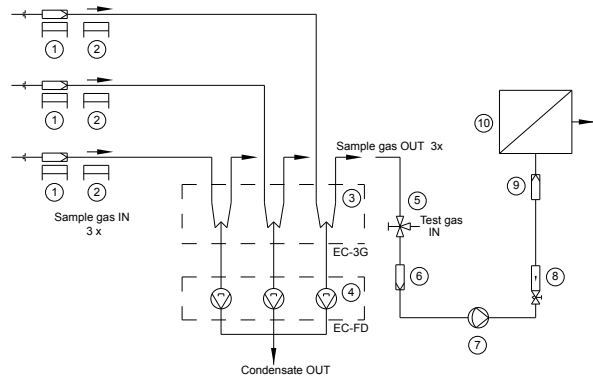
The M&C universal unit EC-D with integrated automatic condensate drainage does not have a fan, but up to 4 peristaltic pumps SR25.1. The basic equipment includes 1 pump.

M&C universal units are mounted under the EC/ECS gas cooler exclusively by the factory. Retrofitting incurs considerable additional expenditure.

Example application for EC-3G /FD

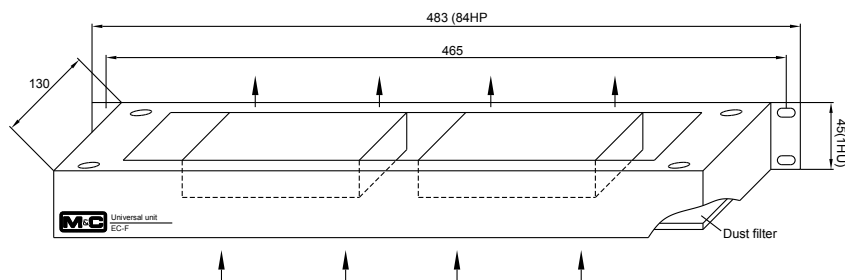


- 1 Heated gas sample probe SP2000-H
- 2 Heated sample line 4M4/6
- 3 Gas cooler EC-3G
- 4 Universal unit EC-FD with 3 peristaltic pumps SR25.1
- 5 3-way ball valve 3L/PV-1
- 6 Fine filter FP-2T-D with liquid alarm LA1
- 7 Diaphragm pump MP 47
- 8 Flow meter FM 10
- 9 Aerosol filter CLF-5/W optional according to application
- 10 Analyzer PMA..

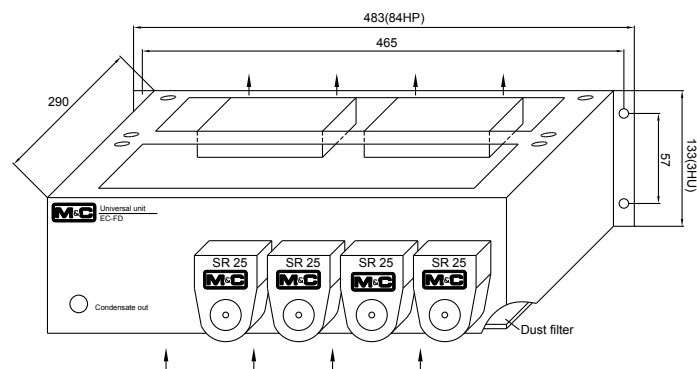


Dimensions

Universal Unit EC-F



Universal Unit EC-FD



Dimensions in mm

Technical Data

Universal Unit EC	Version EC-F	Version EC-FD	Version EC-D
Part No.	02K9530 (a)**	02K9540 (a)**	02K9535 (a)**
Fan/ambient air dust filter pad	2 x/yes		
Peristaltic pump SR25.1		1 x basic; max. 4 pcs. can be mounted	
Condensate connection		1 x hose connection DN 4/6	
Sample gas pressure	See cooler/liquid drainer spec.	Max. 2.2 bar abs.	
Ambient temperature	+5 to +50 °C [41 to 122 °F]		
Ready for working	Immediately		
Main power connection	230 V/50Hz or **Part No. ...-a = 115 V/60 Hz		
Power consumption	35 VA	40 VA #	5 VA #
Electrical connection	Terminals 2.5 mm ² ; cabling intern with EC cooler		
Case protection	IP20 EN 60529		
Electrical standard	EN 61010		
Method of mounting	Substructure for EC cooler		
Case colour	RAL 9003		
Dimensions	84 HP x 1 U x 130 mm [≈ 5.1"]	84 HP x 3 U x 290 mm [≈ 11.4"]	
Weight approximately	2.1 kg [≈ 4.6 lbs]	5.8 kg [≈ 12.8 lbs]	5.2 kg [≈ 11.5 lbs]
Option:			
Part No. for one additional SR25.1 peristaltic pump mounted into a universal unit		1 x 01P1000 + 1 x 01P9100	



LTC-1

Gas- and liquid coolers

Series LC, LG, LT

Jacket cooler with cooling coil
versions LGC-1(S), LC-1(S)

Jacket cooler with bundle of tubes
versions LGT-2, LTC-1

Special Features

- Optimal cooling capacity
- No stagnant space
- Completely out of stainless steel 316Ti
- Dial thermometer
- Wall-mounting
- Various connection sizes available
- Other versions on request

Application

The M&C gas- and liquid coolers series LC, LG and LT are used in analytical technology to lower the dew point of humid gases or to lower the temperature of liquid media by means of water cooling.

Water, for example, serves as a coolant. The countercurrent principle used ensures optimum cooling effect.

Description

The M&C gas coolers LGC-1 and LGC-1S are fully welded with a cooling coil in the jacket tube. The LGC-1S version is equipped with a longer cooling tube.

An integrated separation chamber in the lower part of the gas cooler ensures optimum condensate separation.

In the LGT-2 gas cooler, the medium flows through a tube bundle. There is also a separation chamber in the lower part of the gas cooler for condensate separation.

A dial thermometer is positioned in the coolant inlet of the gas cooler (see dimensions D: coolant IN), which can be used to indicate the gas outlet dew point.

The condensate produced is discharged externally by peristaltic pumps, traps or collecting vessels.

The M&C liquid coolers LC-1 and LC-1S are fully welded to a cooling spiral in the jacket pipe. The LC-1S version is equipped with a longer cooling tube.

In the LGT-2 liquid cooler, the medium flows through a tube bundle. There is a distribution chamber in both the inlet and outlet areas of the tube bundle. The distribution chamber in the upper part of the tube bundle is screwed to the liquid cooler and can be loosened.

A dial thermometer is positioned in the coolant inlet of the LC-1 and LC-1S liquid coolers (see Dimensions D: Coolant IN). In the LTC-1 liquid cooler, the dial thermometer is located in the medium outlet (see Dimensions B: Medium OUT). The dial thermometer can be used to indicate the medium outlet temperature.

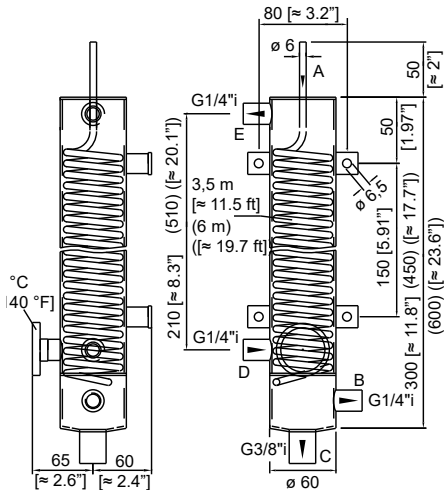
The LC, LG and LT series gas and liquid coolers require little maintenance.

The cooling effect and the stability of the cooling depend, among other things, on the coolant inlet temperature, the coolant quantity, the medium inlet conditions, the aggregate state of the medium to be cooled, ΔT between coolant inlet temperature and medium outlet temperature as well as the ambient temperature.

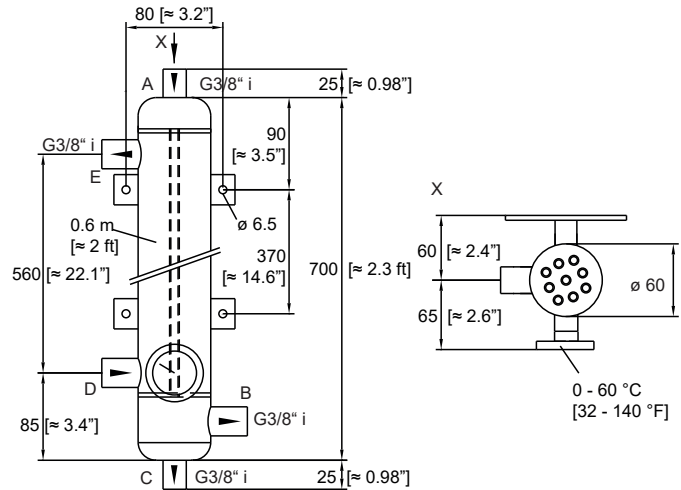
The existing coolant quality and the medium to be cooled must correspond to the material specification of the cooler.

The design and calculation of the coolers is application-specific according to the specified operating data. For your inquiry we need exact operating parameters.

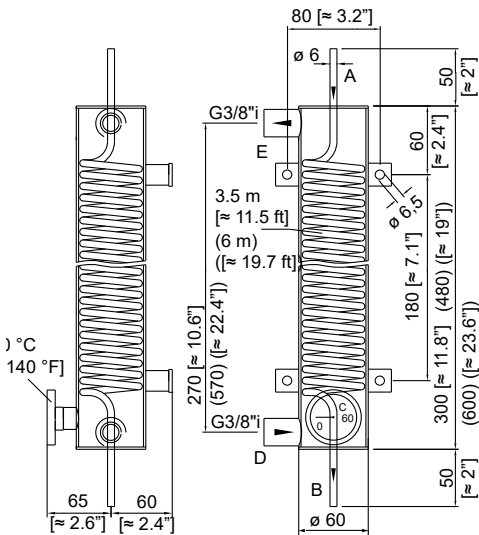
Gas cooler LGC-1 (S)



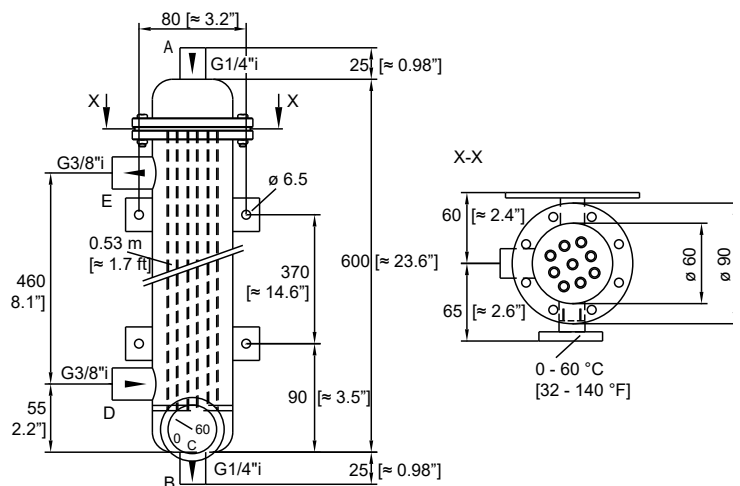
Gas cooler LGT-2



Liquid cooler LC-1 (S)



Liquid cooler LTC-1



Dimensions in mm [inches]

Connections:	A: Sample IN	B: Sample OUT	C: Condensate OUT	D: Coolant IN	E: Coolant OUT
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Coolant Cooler Version L	Gas cooler LGC, LGT			Liquid cooler LC, LTC		
	LGC-1	LGC-1S	LGT-2	LC-1	LC-1S	LTC-1
Part No.	04K1000	04K1500	04K4000	04K2000	04K2500	04K3000
Max. cooling capacity approx.	900 kJ/h	1600 kJ/h	3600 kJ/h/6100 kJ/h ¹⁾	900 kJ/h	1600 kJ/h	3600 kJ/h/6100 kJ/h ¹⁾
Dimension cooling coil	1 x 4/6 mm	1 x 4/6 mm	-	1 x 4/6 mm	1 x 4/6 mm	-
Cooling coil length	3.5 m [≈ 11.5 ft]	6 m [≈ 19.7 ft]	-	3.5 m [≈ 11.5 ft]	6 m [≈ 19.7 ft]	-
Dimension tube bundle	-	-	9 x 6/8 mm	-	-	9 x 6/8 mm
Tube bundle length	-	-	0.6 m [≈ 2.0 ft]	-	-	0.5 m [≈ 1.6 ft]
Connection A (Sample IN)	Tube ø 6mm o.d.	Tube ø 6mm o.d.	G 3/8"i	Tube ø 6 mm o.d.	Tube ø 6mm o.d.	G 1/4"i
Connection B (Sample OUT)	G 1/4"i	G 1/4"i	G 3/8"i	Tube ø 6 mm o.d.	Tube ø 6 mm o.d.	G 1/4"i
Connection C (Condensate OUT)	G 3/8"i	G 3/8"i	G 3/8"i	-	-	-
Connection D/E (Coolant IN/OUT).	G 1/4"i	G 1/4"i	G 3/8"i	G 3/8"i	G 3/8"i	G 3/8"i
Sample flow rate, recommended max.	500 l/h	500 l/h	700 l/h	60 l/h	60 l/h	200 l/h
Max. sample pressure	10 bar g	10 bar g	10 bar g	50 bar g	50 bar g	10 bar g
Max. coolant pressure	10 bar g	10 bar g	10 bar g	10 bar g	10 bar g	10 bar g
Coolant liquid flow rate	50 to 300 l/h, depending on necessary cooling capacity, coolant temperature IN/OUT, etc.					
Differential pressure ΔP sample side	30 mbar at 500 l/h	30 mbar at 500 l/h	< 1 mbar at 500 l/h	700 mbar at 60 l/h	700 mbar at 60 l/h	10 mbar at 200 l/h
Stagnant space sample side	175 ml	210 ml	370 ml/780 ml ¹⁾	44 ml	76 ml	350 ml/740 ml ¹⁾
Max. sample inlet temperature	300 °C [572 °F]	300 °C [572 °F]	300 °C [572 °F]	300 °C [572 °F]	300 °C [572 °F]	300 °C [572 °F]
Ambient temperature	+2 to +80 °C [35.6 to 176 °F]					
Storage temperature	-40 to +80 °C [-33.8 to 176 °F]					
Mounting	Wall-mounting					
Material of medium-contacted parts	Stainless steel 316Ti*					
Dimensions (W x H x D)	110 x 400 x 125 mm [≈ 4.3" x 15.8" x 4.9"]	110 x 700 x 125 mm [≈ 4.33" x 27.6" x 4.9"]	120 x 750 x 125 mm [≈ 4.7" x 29.5" x 4.9"]	110 x 400 x 125 mm [≈ 4.3" x 15.8" x 4.9"]	110 x 700 x 125 mm [≈ 4.33" x 27.6" x 4.9"]	120 x 650 x 125 mm [≈ 4.7" x 25.6" x 4.9"]
Weight	1.8 kg [≈ 4.0 lbs]	3.0 kg [≈ 6.6 lbs]	3.3 kg [≈ 7.3 lbs]	1.8 kg [≈ 4.0 lbs]	3.0 kg [≈ 6.6 lbs]	3.6 kg [≈ 7.9 lbs]

Options for jacket cooler with tube bundle	Gas cooler LGT-2	Liquid cooler LTC-1
	Part No.	Part No.
Pressure rating PN40 with certificate of conformity	04K9000	04K9000
Tube bundle: tube diameter 10/12 mm ¹⁾ instead of 6/8 mm	04K9010	04K9010
Connection D/E (Coolant IN/OUT): G 1/4"i instead of G 3/8"i		04K9015
Connection D/E (Coolant IN/OUT): G 1/2"i instead of G 3/8"i		04K9020
Connection A/B (Sample IN/OUT): G 3/8"i instead of G 1/4"i		04K9025
Connection A/B (Sample IN/OUT): G 1/2"i instead of G 1/4"i.		04K9030
Connection A/B/C/D (Sample IN/OUT, Condensate OUT, Coolant IN/OUT): G 1/4"i instead of G3/8"i	04K9035	
Connection A/B/C/D (Sample IN/OUT, Condensate OUT, Coolant IN/OUT): G 1/2"i instead of G3/8"i	04K9040	

¹⁾ = With option tube bundle diameter 10/12 mm instead of 6/8 mm.

* Standard, others on request.

Maximum cooling capacity refer to over-heated vapor or liquid and sufficient coolant.



VC-1-SL

Pre-Cooling Units Series VC

Versions VC-1, VC-1-SL, VC-2-L, VC-2-SL

Special Features

- With patented Jet-Stream heat exchanger(s)
- Heat exchanger(s) in various materials available
- For condensate separation at room temperature in case of highly water vapor saturated gases
- Light weight
- Version with forced ventilation of the cooling fin block available
- Version with automatic condensate separation available

Application

The M&C pre-cooling units VC are used in gas analysis technology for condensate pre-separation of highly water vapor-saturated gases, for example:

- to relieve the downstream main cooling system
- if water or vapor inrush is expected on the process side,
- if non-heated sample lines are installed without adequate gradient
- for measuring systems with chemical sensors.

Description

The VC pre-cooling units produced by M&C and the special design of the Jet-Stream heat exchangers ensure optimum condensate separation at room temperature. The condensate is discharged externally by peristaltic pumps, traps or collecting vessels.

In the VC-SL pre-cooling units, the SR25.1 peristaltic pumps for automatic condensate drainage are already part of the unit.

To increase the capacity, the VC-L pre-cooling units are equipped with fans for forced ventilation of the cooling fin block. A cover hood is integrated for optimum air flow.

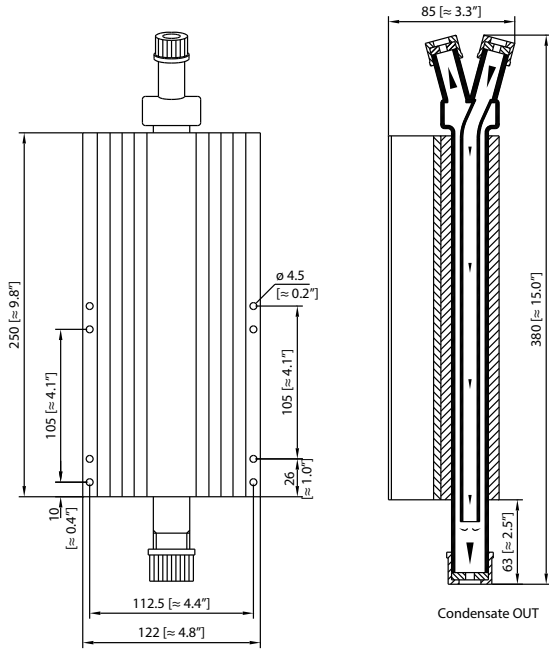
The VC-1 pre-cooling units are equipped with one EC Jet-Stream heat exchanger.

The VC-2 pre-cooling units have two EC-Jet-Stream heat exchangers for connecting two independent gas paths or in the case of parallel or series operation, for connecting a gas path with accordingly large flow rate.

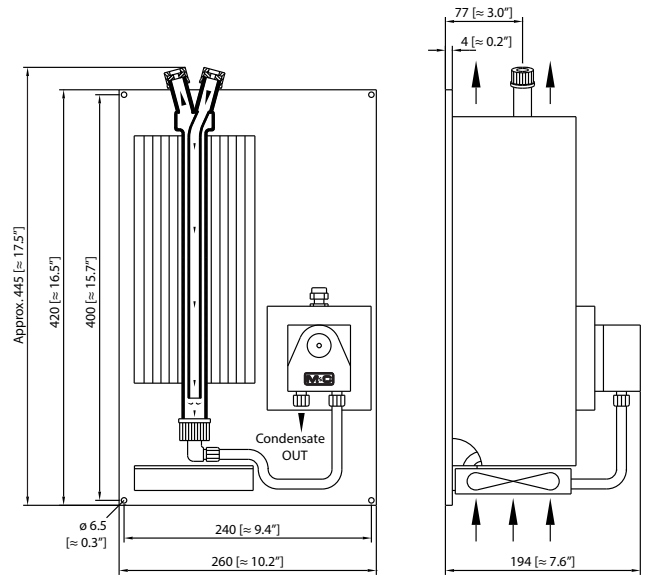
The compact and lightweight design of this device as well as its immediate readiness for operation make it ideal for use in portable and stationary gas conditioning systems.

The VC pre-cooling units require only minimum maintenance.

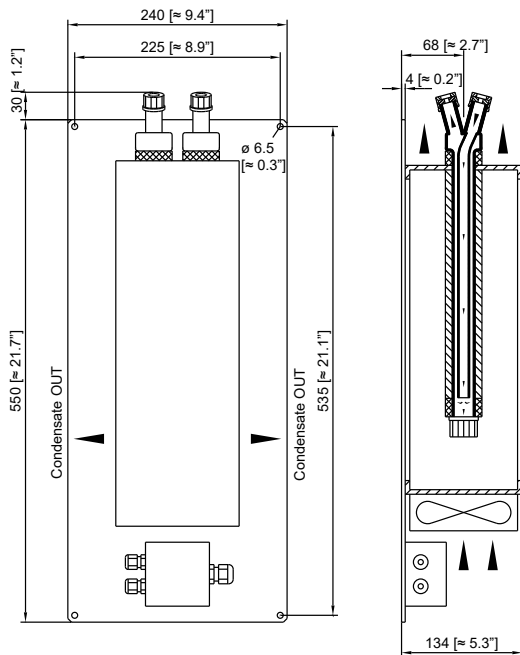
Pre-Cooling Unit VC-1



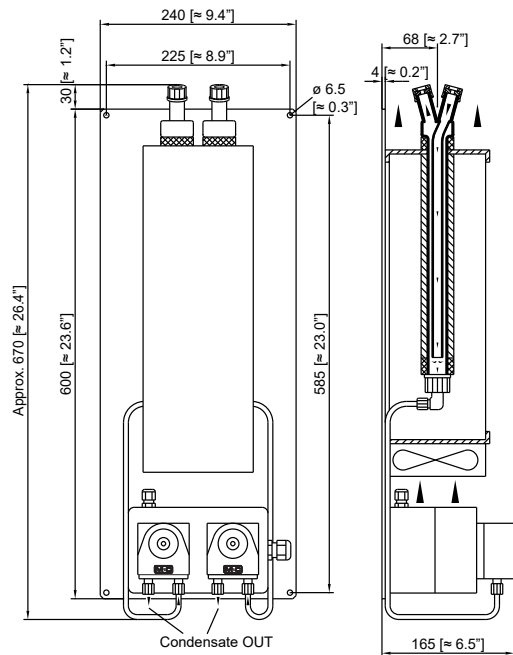
Pre-Cooling Unit VC-1-SL



Pre-Cooling Unit VC-2-L



Pre-Cooling Unit VC-2-SL



Dimensions in mm [Inches]

Pre-cooling units series VC	VC-1	VC-1-SL	VC-2-L	VC-2-SL
Part No. 230 V/50-60 Hz	03K1000	03K3000	03K4000	03K5000
Part No. 115 V/50-60 Hz	03K1000	03K3000a	03K4000a	03K5000a
Jet-Stream heat exchanger(s) out of Duran® glass EC-G	1 x	1 x	2 x	2 x
Forced ventilation	No	Yes	Yes	Yes
Automatic condensate separation with SR25.1		1x*		2x*
Sample gas connection	2 x GL 18-6	2 x GL 18-6	4 x GL 18-6	4 x GL 18-6
Condensate connection	1 x GL 25-12	1 x DN 4/6	2 x GL 25-12	2 x DN 4/6
Power consumption		25 VA	20 VA	30 VA
Gas flow rate recommended, (other flow rates possible)	1 x 250 NI/h	1x 250 NI/h	2 x 250 NI/h	2 x 250 NI/h
Weight approximately	3.5 kg [≈ 7.7 lbs]	7.5 kg [≈ 16.5 lbs]	9 kg [≈ 19.8 lbs]	11 kg [≈ 24.3 lbs]
Sample gas pressure	Max. 3 bar g			
ΔP per heat exchanger	4 mbar at 300 NI/h			
Stagnant space per heat exchanger	Approx. 70 ml			
Sample inlet temperature	Max. 180 °C [356 °F]			
Ambient temperature	+2 to +45 °C [35.6 to 113 °F]			
Storage temperature	0 to +55 °C [32 to 131 °F]			
Electrical connection	Terminals max. 2,5 mm ² , PG11 cable gland			
Electrical standard/Case protection	EN 61010/IP22 EN 60529			
Method of mounting	Wall-mounting			
Ready for operation	Immediately			
Material of sample-contacting parts	Duran® glass, PTFE	Duran® glass, PTFE, PVDF, Novoprene	Duran® glass, PTFE	Duran® glass, PTFE, PVDF, Novoprene

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

Duran® glass is a brand name for borosilicate glass produced by the company Duran Group GmbH