



## Sample gas cooler

### Series TC-Double

# Installation and Operation Instructions

Original instructions





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Read this instruction carefully prior to installation and/or use. Pay attention particularly to all advises and safety instructions to prevent injuries. Bühler Technologies can not be held responsible for misusing the product or unreliable function due to unauthorised modifications.

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# 1 Introduction

## 1.1 Intended use

This unit is intended for industrial use in gas analysis systems. It's an essential component for conditioning the sample gas to protect the analysis instrument from residual moisture in the sample gas.

Please note the specifications in the data sheet on the specific intended use, existing material combinations, as well as pressure and temperature limits.

## 1.2 Overview

The TC-Double series was designed specifically for high cooling capacities, high ambient temperatures and to cool in two cycles to minimise wash out effects. The two cooling blocks on the TC-Double+ can be set do different temperatures.

Any other use of this cooler is determined by the type of built-in passive pre-cooling, i.e. the first cooling level is not controlled electronically.

The Peltier cooler is distinguished by two types according to cooling capacity or operation 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	
Operation temperature	40 °C	50 °C
2 heat exchangers in series	TC-Double 6111	TC-Double 6112
2 heat exchangers in series	TC-Double+ 6111	TC-Double+ 6112

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

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

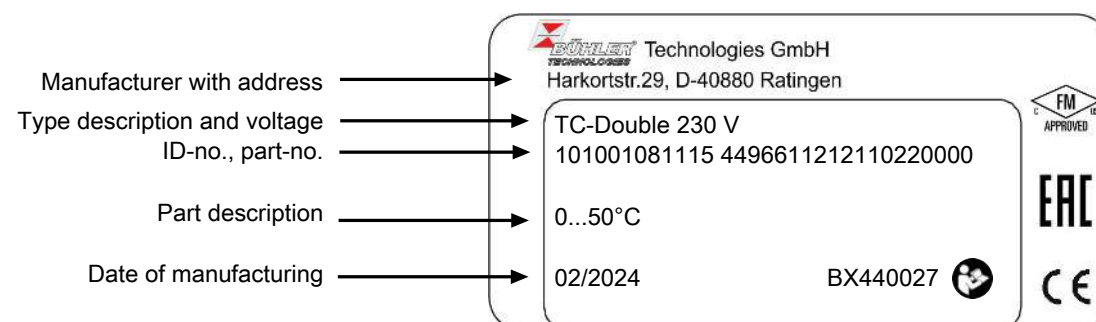
In addition, we offer different signal outputs:

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

This allows for various configurations of cooler and options. Here the approach is to simplify creating a complete system in a cost-efficient way through pre-installed components with hoses connected. We further paid attention to easy access to wear parts and consumables.

## 1.3 Type plate

**Example:**



## 1.4 Scope of delivery

- Cooler
- Product documentation
- Connection-/mounting accessories (optional)

## 1.5 Ordering instructions

### 1.5.1 TC-Double

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

4496	6	1	1	X	1	X	1	X	X	X	X	X	0	0	0	0	Product Characteristics
																	<b>Gas cooler model</b>
1																	TC-Double 6111: Ambient temperature 40 °C
2																	TC-Double 6112: Ambient temperature 60 °C
																	<b>Certifications</b>
1																	for common locations - FM
																	<b>Supply voltage</b>
1																	115 V AC, 50/60 Hz
2																	230 V AC, 50/60 Hz
																	<b>Heat exchanger</b>
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
																	<b>Condensate drain</b> <sup>1)</sup>
0																	without condensate drain
2																	CPdouble with hose nipple, angled
4																	CPdouble with screw connection <sup>2)</sup>
																	<b>Sample gas pumps</b> <sup>1) 3)</sup>
0																	without sample gas pump
1																	P1, PVDF
2																	P1, with bypass valve
																	<b>Humidity sensor/filter</b> <sup>1) 2)</sup>
0 0																	without filter, without moisture detector
0 1																	without filter, 1 moisture detector with PVDF adapter <sup>4)</sup>
1 0																	1 filter, without moisture detector
1 1																	1 filter with built-in moisture detector
																	<b>Signal outputs</b>
0 0																	status output only
1 0																	Analog output, 4...20 mA additional

<sup>1)</sup> With this option, the maximum ambient temperature is limited to 50 °C.

<sup>2)</sup> Metric or US connection, per heat exchanger.

<sup>3)</sup> Factory installed tubing for suction operation.

<sup>4)</sup> Also available in stainless steel.

## 1.5.2 TC-Double+

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

4496	6	1	1	X	1	X	1	X	X	X	X	X	X	0	0	0	0	Product Characteristics
<b>Gas cooler model</b>																		
1																	TC-Double+ 6111: Ambient temperature 40 °C	
2																	TC-Double+ 6112: Ambient temperature 60 °C	
<b>Certifications</b>																		
1																	for common locations - FM	
<b>Supply voltage</b>																		
1																	115 V AC, 50/60 Hz	
2																	230 V AC, 50/60 Hz	
<b>Heat exchanger</b>																		
1	2	2															Duran glass, PTG-2, metric	
1	2	7															Duran glass, PTG-2-I, US	
1	3	2															PVDF, PTV-2, metric	
1	3	7															PVDF, PTV-2-I, US	
<b>Condensate drain</b> <sup>1)</sup>																		
			0														without condensate drain	
			2														CPdouble with hose nipple, angled	
			4														CPdouble with screw connection <sup>2)</sup>	
<b>Sample gas pumps</b> <sup>1) 3)</sup>																		
			0														without sample gas pump	
			1														P1, PVDF	
			2														P1, with bypass valve	
<b>Humidity sensor/filter</b> <sup>1) 2)</sup>																		
			0	0													without filter, without moisture detector	
			0	1													without filter, 1 moisture detector with PVDF adapter <sup>4)</sup>	
			1	0													1 filter, without moisture detector	
			1	1													1 filter with built-in moisture detector	
<b>Signal outputs</b>																		
			0	0													status output only	
			1	0													Analog output, 4...20 mA additional	

<sup>1)</sup> With this option, the maximum ambient temperature is limited to 50 °C.

<sup>2)</sup> Metric or US connection, per heat exchanger.

<sup>3)</sup> Factory installed tubing for suction operation.

<sup>4)</sup> Also available in stainless steel.

## 2 Safety instructions

### 2.1 Important advice

Operation of the device is only permitted if:

- the product is used under the conditions described in the installation- and operation instruction, the intended application according to the type plate and the intended use. In case of unauthorized modifications done by the user Bühler Technologies GmbH can not be held responsible for any damage,
- when complying with the specifications and markings on the nameplates.
- the performance limits given in the datasheets and in the installation- and operation instruction are obeyed,
- monitoring devices and safety devices are installed properly,
- service and repair is carried out by Bühler Technologies GmbH,
- only original spare parts are used.

This manual is part of the equipment. The manufacturer keeps the right to modify specifications without advanced notice. Keep this manual for later use.

### Signal words for warnings

<b>DANGER</b>	Signal word for an imminent danger with high risk, resulting in severe injuries or death if not avoided.
<b>WARNING</b>	Signal word for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.
<b>CAUTION</b>	Signal word for a hazardous situation with low risk, resulting in damaged to the device or the property or minor or medium injuries if not avoided.
<b>NOTICE</b>	Signal word for important information to the product.

### Warning signs

These instructions include the following warnings:

	General warning sign		General mandatory sign
	Voltage warning		Unplug from mains
	Warning not to inhale toxic gases		Wear respiratory equipment
	Warning of corrosive substances		Wear a safety mask
	Warning of explosion hazard		Wear gloves



## 2.2 General hazard warnings

The equipment must be installed by a professional familiar with the safety requirements and risks.

Be sure to observe the safety regulations and generally applicable rules of technology relevant for the installation site. Prevent malfunctions and avoid personal injuries and property damage.

### The operator of the system must ensure:

- Safety notices and operating instructions are available and observed,
- The respective national accident prevention regulations are observed,
- The permissible data and operational conditions are maintained,
- Safety guards are used and mandatory maintenance is performed,
- Legal regulations are observed during disposal,
- compliance with national installation regulations.
- the device is protected from mechanical loads.

### Maintenance, Repair

Please note during maintenance and repairs:

- Repairs to the unit must be performed by Bühler authorised personnel.
- Only perform conversion-, maintenance or installation work described in these operating and installation instructions.
- Always use genuine spare parts.
- Do not install damaged or defective spare part. If necessary, visually inspect prior to installation to determine any obvious damage to the spare parts.

Always observe the applicable safety and operating regulations in the respective country of use when performing any type of maintenance.

#### DANGER

##### Electrical voltage



Electrocution hazard.

- a) Disconnect the device from power supply.
- b) Make sure that the equipment cannot be reconnected to mains unintentionally.
- c) The device must be opened by trained staff only.
- d) Regard correct mains voltage.



#### DANGER

##### Toxic, corrosive gas/condensate



Sample gas/condensate may be hazardous to health.

- a) If necessary, ensure a safe gas/condensate discharge.
- b) Always disconnect the gas supply when performing maintenance or repairs.
- c) Protect yourself from toxic/corrosive gasses/condensate when performing maintenance. Wear appropriate protective equipment.



#### DANGER

##### Potentially explosive atmosphere



Explosion hazard if used in hazardous areas.

The device is not suitable for operation in hazardous areas with potentially explosive atmospheres.

Do not expose the device to combustible or explosive gas mixtures.

## 3 Transport and storage

Only transport the product inside the original packaging or a suitable alternative.

The equipment must be protected from moisture and heat when not in use. It must be stored in a covered, dry and dust-free room at a temperature of -20 °C to 60 °C (-4 °F to 140 °F).

## 4 Installation and connection

### 4.1 Installation site requirements

The unit is only intended for wall-mounted use in enclosed areas. Adequate protection from the weather must be provided when used outdoors.

Install the unit leaving enough room below the cooler to discharge the condensate. Leave room above for the gas supply.

Be sure to maintain the approved ambient temperature. Do not obstruct the convection of the cooler. The vents must have enough room to the next obstacle. The distance must especially be a minimum of 10 cm on the air outlet side.

Ensure adequate ventilation when installing in enclosed housings, e.g. analyser cabinets. If the convection is inadequate, we recommend aerating the cabinet or installing a fan to lower the inside temperature.

### 4.2 Installation

Run the gas supply to the cooler with a downward slope. The gas inputs are marked in red and additionally labelled "IN".

If a large amount of condensate accumulates, we recommend using a condensate trap with automatic condensate drain before the cooler.

Glass vessels and automatic condensate drains are available for draining condensate for external mounting below the unit. When using automatic condensate drains, the sample gas pump must be installed ahead of the cooler (pressure operation) to ensure proper function of the condensate drain.

If the sample gas pump is located at the cooler outlet (suction operation), we recommend using glass condensate traps or peristaltic pumps.

#### 4.2.1 Flow adapter connection (optional)

When ordering the cooler with the **option moisture detector without filter**, it will be factory installed inside a flow adapter.

The connection between the heat exchanger outlet and the flow adapter inlet does not have tubing included. The connection G1/4 or NPT 1/4" (flow adapter marked NPT) for the gas inlet/outlet must be carefully and properly connected using a suitable screw connection. Here the direction of flow is not relevant.

#### 4.2.2 Connecting the moisture detector (option)

When ordering the cooler with **moisture detector option**, it will be factory installed inside a flow adapter, or for the **filter option** installed and connected in the filter head.

#### 4.2.3 Connecting the peristaltic pump (option)

Coolers ordered with attached peristaltic pump already have it installed and wired. Heat exchangers ordered at the same time are already installed and connected to the peristaltic pump.

The connection via the condensate outlet screw connection on the pump must be carried out carefully and properly.

#### NOTICE



Installing peristaltic **pumps** CPsingle / CPdouble limits the maximum permissible **operating pressure** in the system!  
Operating pressure ≤ 1 bar

#### 4.2.4 Sample gas pump connection gas lines (optional)

On coolers ordered with attached sample gas pump these are already installed and wired. Add-on parts ordered at the same time are already installed and connected to the sample gas pump.

Avoid mixed-material installation, i.e. metal piping to plastic bodies. If this cannot be avoided in isolated applications, screw the metal connections into the pump body with care, never use force.

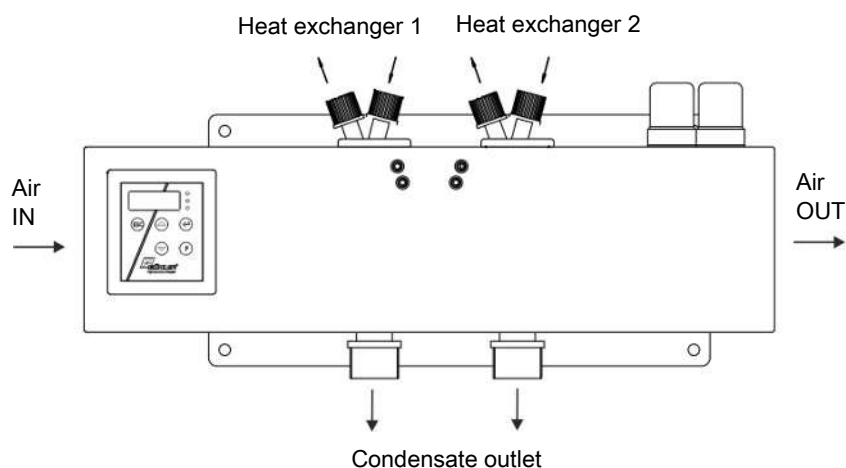
Lay the lines so the line at the inlet and outlet remains flexible for an adequate distance.

The pumps are marked **IN** for inlet and **OUT** for outlet at the mounting ring. Be sure the gas line connections are tight.

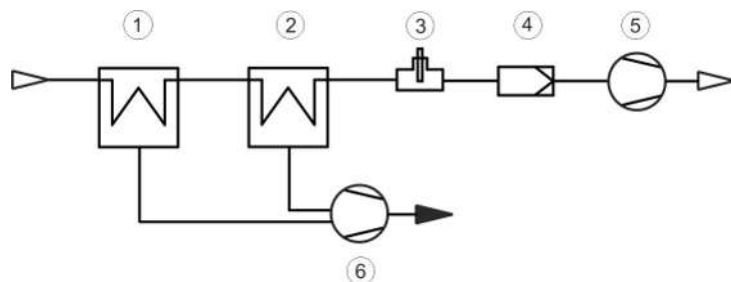
## 4.2.5 Connecting the heat exchanger

To minimise gas wash out in the cooler, the two (identical) heat exchangers must be operated in series. This should be done as follows:

1. Gas inlet line to red gas inlet on heat exchanger no. 2 (pre-cooling).
2. Connection between the heat exchanger no. 2 gas outlet and the red gas inlet on heat exchanger no. 1 (after-cooling).
3. Secure final gas outlet line to the heat exchanger no. 1 gas outlet.



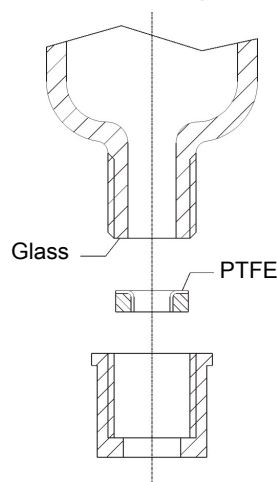
### Flow chart:



1 Heat exchanger 2 / pre-cooling	4 Filter (optional)
2 Heat exchanger 1 / after-cooling	5 Sample gas pump (optional)
3 Moisture detector (option)	6 Condensate pump (optional)

The gas inputs are marked in red.

On glass heat exchangers the correct position of the seal is important when connecting the gas lines (see image). The seal consists of a silicone ring with a PTFE sleeve. The PTFE side must face the glass thread.



Pay attention to the appropriate spanner size when selecting fittings for stainless steel heat exchangers.

PTS/PTS-I gas connections: SW 14 or 9/16"

PTS/PTS-I condensate out connections: SW 22

## 4.2.6 Condensate drain connection

Depending on the material, build a connecting line with fittings and tubing or hose between the heat exchanger and condensate drain. For stainless steel, the condensate drain can be hung directly from the connecting tube; for hoses, the condensate drain must be secured separately using a clamp.

The condensate drain can be mounted directly to the heat exchanger.

Condensate lines must always be installed with a slope and a minimum inside diameter of DN 6/8 (1/4").

## 4.3 Electrical connections

The operator must install an external separator for the device which is clearly assigned to this device.

This separator

- must be located near the device,
- must be easy for the operator to reach,
- must comply with IEC 60947-1 and IEC 60947-3,
- must separate all live conductors and the status output, and
- must not be attached to the power feed.

The mains supply of the device must be fused according to the specifications under technical data.

### Potential equalization/static charge

Static charges can result in incendive sparking. Avoid static charges. Any conductive parts of the cooler must be grounded!

The housing has a connection for an earth/equipotential bonding conductor. Ensure the housing is adequately earthed (minimum conductor cross-section 4 mm<sup>2</sup>).

#### WARNING



#### Hazardous electrical voltage

The device must be installed by trained staff only.

#### CAUTION



#### Wrong mains voltage

Wrong mains voltage may damage the device.  
Regard the correct mains voltage as given on the type plate.

#### WARNING



#### High voltage

Damage to the device in case of insulation testing  
**Do not proceed insulation tests with high voltage** to the device as a whole!

### Electric strength test

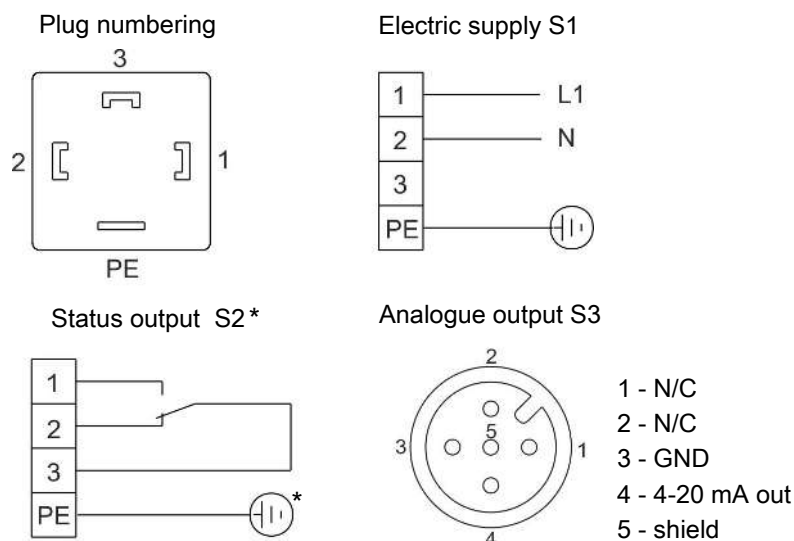
This device is equipped with extensive EMC protection. The necessary tests were carried out at the factory (test voltage 2.1 kV or 2.55 kV DC depending on approval).

If you wish to check the electric strength again yourself, you can do so on the entire unit. Only test the device with the specified values using direct current voltage. Testing the electric strength with alternating current voltage will damage electronic components. The recommended voltage in this case is 2.1 kV DC, 2 s. Disconnect all supply lines from the device before testing. Power can be supplied via the mains connection.

## Plug connection

This device has one EN 175301-803 plug each for the power supply and the signal output. If the lead is connected correctly, these cannot be confused. Therefore please be sure to correctly reassemble the plugs after connecting the wires. Below you will find the pin assignments, with the numbers corresponding to those on the plugs:

The supply line cross-sections must be suitable for the rated current. Use a maximum line cross-section of 1.5 mm<sup>2</sup> (AWG 16) and a cable diameter of 8 - 10 mm (0.31 - 0.39 inch).



\* When using the status output with voltage  $\geq 33$  V AC or  $\geq 70$  V DC, the protective earth conductor (PE) must be connected.

The clamping areas for S1 and S2 are 8–10 mm (0.31–0.39 inches) in diameter.

## 4.4 Signal outputs

The device has various status signals. The maximum switching power of the status outputs is 250 V AC/150 V DC, 2 A, 50 VA, each.

An alarm is triggered by the status output (S2) if the temperature in block 1 is outside the specified limits. It does not indicate if the alarm was triggered due to excess temperature or insufficient temperature.

### Description of signal outputs

	Function/contact type	Description	
Regarding S2)	internal changeover contact: max. 250 V AC/ 150 V DC, 2 A, 50 VA	the following device statuses can be indicated via two switching outputs:	Contact between 3 and 2 closed (alarm) <ul style="list-style-type: none"> <li>– No mains voltage and/or actual temperature outside the alarm thresholds</li> </ul> Contact between 3 and 1 closed (ok) <ul style="list-style-type: none"> <li>– Mains voltage attached + actual temperature within the alarm thresholds</li> </ul>
Regarding S3)	4-20 mA analogue output ( $R_{Load} < 500 \Omega$ )	Signalling of actual temperature in block 1 (please use shielded cables)	$T_{Cooler} = -20 \text{ °C } \triangleq (-4 \text{ °F}) \rightarrow 4 \text{ mA/ } 2 \text{ V}$ $T_{Cooler} = 5 \text{ °C } \triangleq (41 \text{ °F}) \rightarrow 9 \text{ mA/ } 4,5 \text{ V}$ $T_{Cooler} = 60 \text{ °C } \triangleq (140 \text{ °F}) \rightarrow 20 \text{ mA/ } 10 \text{ V}$

**The front film on the display module has three LEDs:**

Colour	Marking	Function
Red	S2	High/low temperature Device error
Yellow	S1	Reserved
Green	OP	Normal operation

The LEDs OP and S2 indicate the device status similar to S2.

If the option “temperature signal” is built in, the unit has a signal output via the analogue output to indicate the actual cooler temperature.

The temperature signal can be read via the panel plug (S3) using the M12x1 connector. This plug is located next to the moisture detector connectors at the top of the cooler.

The temperature (CH1) which continuously appears in the display corresponds to the temperature in block 1 (after-cooling). The analogue temperature signal also corresponds to the temperature in block 1.

## 5 Operation and control

### NOTICE



The device must not be operated beyond its specifications.

After switching on the cooler the block temperature will be displayed (block 1). The display will flash until the block temperature has reached the preset target value ( $\pm$  adjustable alarm range). The status contact is in the Alarm position.

Once the target temperature range has been reached, the temperature will continuously be displayed and the status contact switches over.

If the display flashes during operation or an error message appears, please refer to bullet "Troubleshooting".

Please refer to the data sheet for performance data and maximum ratings.

### 5.1 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 ( $^{\circ}\text{C}$  /  $^{\circ}\text{F}$ ) (factory preset  $^{\circ}\text{C}$ ). 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  $^{\circ}\text{C}$  (36  $^{\circ}\text{F}$  to 68  $^{\circ}\text{F}$ ) (factory preset 5  $^{\circ}\text{C}$ /41  $^{\circ}\text{F}$ ).

And then the warning thresholds can be adjusted for low and excess temperature. These are set relative to the outlet dew point  $\tau_a$  setting.

For the low temperature the range is  $\tau_a -1$  to  $-3\text{ K}$  (at a minimum 1  $^{\circ}\text{C}$ / 34  $^{\circ}\text{F}$  cooling block temperature), for the excess temperature the range is  $\tau_a +1$  to  $+7\text{ K}$ . 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.

The TC-Double has an additional cooling stage for pre-cooling the gas (heat exchanger 2), the block temperature of which varies by ambient temperature and load. The target value of the pre-cooling stage corresponds to that of block 1.



## 5.2 Use of menu functions

### Brief description of the operating principle:

The unit is operated using 5 keys. Their functions are:

Button	Section	Functions
← or OK	Display	– Switches from the measurement display to the main menu
	Menu	– Selects the menu item displayed
	Enter	– Applies an edited value or a selection
▲	Display	– temporarily switches to the alternative measurement display (if option installed)
	Menu	– Back
	Enter	– Increase value or browse selection – Note: – Press button 1 x = changes parameter / value by one; – Hold button = fast mode (numerical values only) – Display flashes: modified parameter/value – Steady display: original display/value
▼	Display	– temporarily switches to the alternative measurement display (if option installed)
	Menu	– Next
	Enter	– Reduce value or browse selection
ESC	Menu	– Move one level up
	Enter	– Return to menu Changes will not be saved!
F or Func		– Sets a menu to favourite. (Note: The favourite menu will also be activated with the menu locked!)

### 5.2.1 Lock Menu

Some menus can be locked to prevent inadvertently changing the settings of the unit. This requires setting a code. For information on setting up or disabling the menu lock please refer to "Global Settings" (*tOP*) under menu item *tOP* > *Loc*.

The menu lock is **not** enabled at the time of delivery, all menu items can be accessed.

With the menu locked, only the following menu items will be visible without entering the correct code:

Menu item	Explanation
<i>tOP</i> > <i>uni</i> <	Temperature unit selection (°C or °F).
F or Func.	Accessing the Favourites menu
	<b>NOTICE! This menu may be one that is normally locked.</b>

## 5.2.2 Menu navigation overview

When pressing the **OK** button in normal mode, the display will show the prompt **codE** if the menu is locked. Use the **▲** and **▼** buttons to enter the correct code and press **OK**.

If an incorrect code or no code is entered, the menu will not be unlocked and you will not be able to access all menu items.

If you forgot the password you can always enter master code 287 to access the menu; the menu will be unlocked.

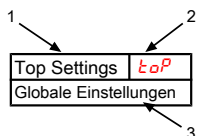
The following image shows an overview of the menu structure.

Items with a dashed frame will only appear with the respective settings or with the respective status messages.

The factory defaults and settings ranges are specified in the overview as well as under the respective menu item. The factory defaults apply unless otherwise agreed.

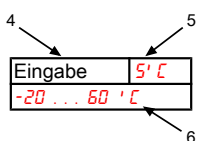
You can cancel entries and menu selections without saving by pressing the **ESC** key.

### Menu:

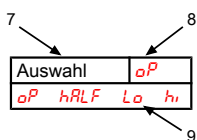


1. Menu designation
2. Display
3. Brief description

### Parameter:



4. Value input
5. Factory preset
6. Parameter range



7. Selecting from the list of values
8. Factory preset
9. Parameter range/selection

### Optional menu navigation:



10. dashed box = Optional

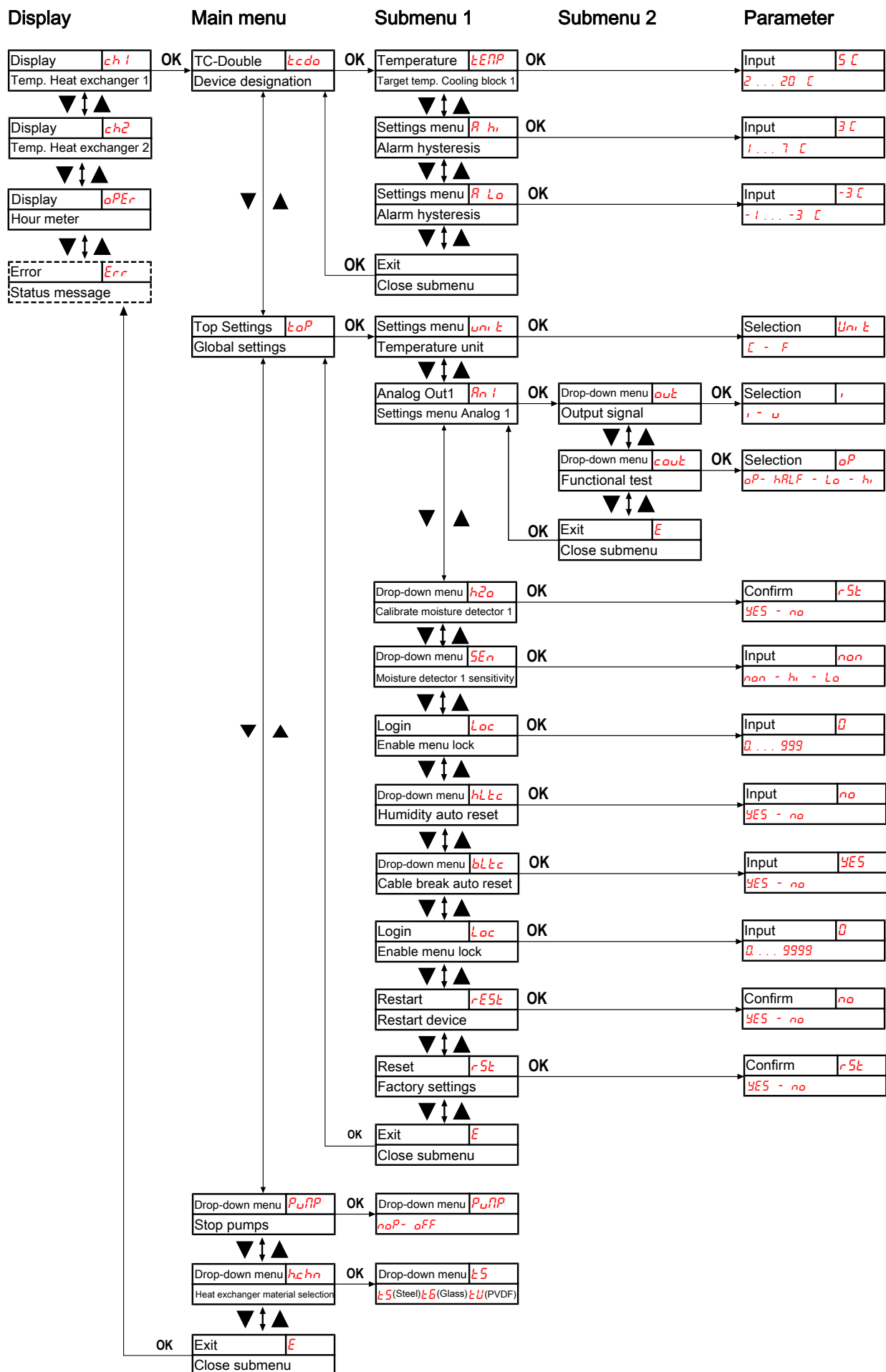


Fig. 1: TC-Double menu overview

## 5.3 Description of menu functions

### 5.3.1 Display menu

#### Block temperature display

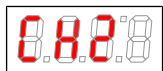
Display → *chl*



Depending on the device state, the temperature will be displayed as a constant, flashing, or alternating with a status message.

#### Pre-cooling stage display

Display → *chl2*



Depending on the device state, the temperature will be displayed as a constant, flashing, or alternating with a status message.

#### Operating hours /runtime display

Display → *oPEr*

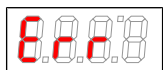


Displays the operating hours of the unit. The runtime cannot be reset and can be output in various display formats. To view/exit the runtime, press the „Enter“ key.

- *yyMn* – display in years and months (default)
- *Mth* – display in months
- *WEEh* – display in weeks
- *dRYS* – display in days
- One month corresponds to 30 days. Press the „F“ key to switch between the display formats. The display will then first show the selected format as short text, then the duration.

#### Error code display

Display → *Err*

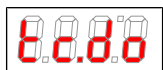


In the event of errors/malfunctions not related to operation, the error code indicates possible causes and solutions.

### 5.3.2 Main menu

#### Peltier cooler TC-Double

Display → *tcdo*



This will take you to the cooler target temperature and the tolerance range setting (alarm threshold).

#### Global setting

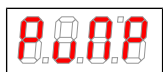
Display → *toP* (ToP Settings)



This menu is used to configure the global cooler settings.

## Peristaltic Pump

Display → *PuMP*



Switching the peristaltic pump on and off.

Parameter range: *noP*, *oFF*

Factory setting: *noP*

Note: Status switches, "*PuMP*" flashes.

## Heat exchanger material selection

Display → *hchh*



Heat exchanger material selection

Parameter range: *LS* (Steel), *LG* (Glass), *LU* (PVDF)

Factory setting: *LS* (cooler without heat exchanger), or respective material per configuration

## Exit main menu

Display → *E*



Selecting this will return you to display mode.

## 5.3.3 Submenu 1

### Target temperature

Display → Cooler → *LEMP*



This setting determines the nominal temperature for the cooler temperature.

Parameter range: 2 °C to 20 °C (35.6 °F to 68 °F)

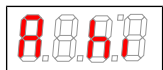
Factory setting: 5 °C (41 °F)

Note: If the temperature is changed the indicator may blink, until the new operating range has been reached.

This menu item is hidden if the keylock is enabled.

### upper alarm limit

Display → Cooler → *A hi* (Alarm high)



Here you can set the upper threshold for the visual signal and the status relay. The alarm limit is set based on the cooler temperature setting.

Parameter range: 1 °C to 7 °C (1.8 °F to 12.6 °F)

Factory setting: 3 °C (5.4 °F)

Note: This menu item is hidden if the keylock is enabled.

## lower alarm limit

Display → Cooler → **R Lo** (Alarm low)



Here you can set the lower threshold for the visual signal and the status relay. The alarm limit is set based on the cooler temperature setting.

Parameter range: -1 °C to -3 °C (-1.8 °F to -5.4 °F)

Factory setting: -3 °C (-5.4 °F)

Note: This menu item is hidden if the keylock is enabled.

## Exit submenu 1

Display → Submenu → **E**

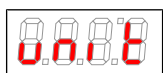


Selecting this will return you to the main menu.

## 5.3.4 Submenu 1 (Global Settings)

### Temperature unit

Display → **LoP** → **uni t**



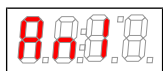
Used to select the temperature display unit.

Parameter range: **C**, **F**

Factory setting: **C**

### Analog output

Display → **LoP** → **An 1**

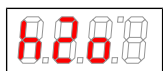


This submenu is used to specify the settings for analog output 1, see chapter Submenu 2 (Analog Output 1)

Note: This menu will be hidden if the menu is locked.

### Calibrate moisture detector

Display → **LoP** → **h2o**



If a moisture detector is installed, calibration can now be performed. To do so, the unit must be flushed with dry gas.

Note: Calibration was performed at the factory using ambient air. After replacing the moisture detector a calibration is again required.

Calibrating the moisture detector will set the menu **SEn** to **hi**.

This menu will be hidden if the menu is locked.

### Moisture detector sensitivity

Display → **LoP** → **SEn**



If moisture detectors are installed, the sensitivity can be reduced here.

Parameter range: **hi** : high sensitivity  
**Lo**: low sensitivity  
**non**: no moisture detector

Factory setting: **hi**

Note: This menu will be hidden if the menu is locked.

## Moisture detector: manual or automatic reset following moisture ingress

Display → *LoP* → *hLtc*

(*hLtc* = humidity latch). The setting applies to all connected moisture detectors.



Specifies whether the moisture ingress message must be reset manually or will automatically be reset after the sensor dries.

Parameter range: *YES*: The status will be indicated until the user restarts the device and the pumps will be disabled.  
*no*: The status message will automatically be cleared/the pumps will be released again once moisture is no longer detected.

Factory setting: *no*

Note: This menu will be hidden if the menu is locked.

## Moisture detector: error cleared automatically after cable break

Display → *LoP* → *bLtc*

(*bLtc* = broken wire latch). The setting applies to all connected moisture detectors.



Determines whether the cable break alarm must be reset manually or will automatically clear on valid measuring signal.

Parameter range: *YES*: The status will be indicated until the user restarts the device. Clears the error, and the pumps will be deactivated.  
*no*: The error message will disappear. The pumps will be switched on again once the moisture detector is reactivated again.

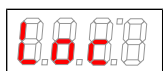
Factory setting: *YES*

Note: This menu will be hidden if the menu is locked.

## Lock Menu

To protect the menu from unauthorised use, enter a value for the lock code. Menu items can then only be accessed after entering the correct code.

Display → *LoP* → *Loc*



This setting will cancel/enable the menu lock.

Parameter range: 0 to 9999

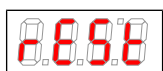
Factory setting: 0 (keylock cancelled)

Note: This menu will be hidden if the menu is locked.

## Restart

Display → *LoP* → *rESt*

(*rESt* = restart)



The device will restart, all settings are saved. All error messages will be reset.  
The moisture detector will be reset, irrespective of the settings in menus *hLtc* and *hFlo*.

Parameter range: *YES*: Restart. The display will show the software version for the device and returns to measurement display.  
*no*: Exit menu without restarting.

Note: The user settings will be saved.

## Factory settings

Display → *LoP* → *rSt*



This setting restores the factory settings.

Parameter range: *yES*: factory settings restored.  
*no*: Exit menu without making changes.

Factory setting: *no*

Note: This menu will be hidden if the menu is locked.

## Exit submenu 1

Display → Submenu → *E*



Selecting this will return you to the main menu.

## 5.3.4.1 Submenu 2 (Analog Output 1)

The analog output will display the actual cooler temperature.

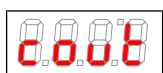
### Signal behaviour

In normal mode (*noP*) the measuring point will output the actual temperature. For testing purposes you can generate constant values *hi*, *Lo* or *hRLF*. The analogue output will output a constant signal with a value as specified in the table.

Constant	Current output 4 – 20 mA	Voltage output 2 – 10 V
<i>hi</i>	20 mA	10 V
<i>hi</i>	12 mA	6 V
<i>Lo</i>	4 mA	2 V
<i>noP</i>	4 – 20 mA	2 – 10 V

After testing, the signal behaviour must be changed back to normal mode (*noP*).

Display → *LoP* → *An I* → *out*



This setting determines how the analogue output will behave.

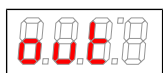
Parameter range: *noP* = Operation (normal mode), *hi*, *Lo*, *hRLF*

Factory setting: *noP*

Note: This menu will be hidden if the menu is locked.

## Selection -> Output Signal

Display → *LoP* → *An I* → *out*



Select the type of output signal.

Parameter range: *i* Status output 4... 20 mA  
*v* Status output 2...10 V

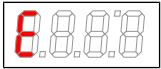
Factory setting: *i*

Note: Disconnect meter before switching!  
 This menu item is hidden if the keylock is enabled.



## Exit Submenu 2

Display → *LoP* → *Rn I* → *E*



Selecting this will return you to submenu 1.

## 5.3.5 Set favourite menu

Use the **F** or **Func** (function) key to set a favourite menu to later open it with just the push of a button.

- Open the menu you wish to set as the favourite. This menu can also be a lockable menu.
- Press the function key for more than 3 sec.  
The current menu has been set as the favourite. The display will briefly show the message *Func*.
- Press **ESC** or *E* (Exit) to return to the display.

To now access the favourite menu, press the **F** or **Func** key.

**NOTICE! The favourite menu can also be accessed if the menu is locked.**

## 6 Maintenance

The basic version of the cooler requires no special maintenance.

However, it may have different options depending on the cooler model. In this case the following maintenance must be performed regularly:

- **Optional peristaltic pump:** Checking hoses (see chapter Replacing the hoses of the peristaltic pump (option))
- **Filter option:** Checking the filter element (see chapter Replacing the filter element (option))
- **Optional moisture detector:** Calibrating the moisture detector (see chapter Calibration of the moisture detector (option))
- **Optional sample gas pump:** Check valves for contamination. After 500 operating hours tighten the screws for the mounting ring to 3 Nm. (see chapter Replacing sample gas pump inlet and outlet valves (optional))

During maintenance, remember:

- The equipment must be maintained by a professional familiar with the safety requirements and risks.
- Only perform maintenance work described in these operating and installation instructions.
- Observe the respective safety regulations and operating specifications when performing any type of maintenance.
- Always use genuine spare parts.

### DANGER



#### Electrical voltage

Electrocution hazard.

- a) Disconnect the device from power supply.
- b) Make sure that the equipment cannot be reconnected to mains unintentionally.
- c) The device must be opened by trained staff only.
- d) Regard correct mains voltage.



### DANGER



#### Toxic, corrosive gas/condensate

Sample gas/condensate may be hazardous to health.

- a) If necessary, ensure a safe gas/condensate discharge.
- b) Always disconnect the gas supply when performing maintenance or repairs.
- c) Protect yourself from toxic/corrosive gasses/condensate when performing maintenance. Wear appropriate protective equipment.



## 7 Service and repair

This chapter contains information on troubleshooting and correction should an error occur during operation.

Repairs to the unit must be performed by Bühler authorised personnel.

Please contact our Service Department with any questions:

**Tel.: +49-(0)2102-498955** or your agent

For further information about our services and customised maintenance visit <http://www.buehler-technologies.com/service>.

If the equipment is not functioning properly after correcting any malfunctions and switching on the power, it must be inspected by the manufacturer. Please send the equipment inside suitable packaging to:

**Bühler Technologies GmbH**

**- Reparatur/Service -**

**Harkortstraße 29**

**40880 Ratingen**

**Germany**

Please also attach the completed and signed RMA decontamination statement to the packaging. We will otherwise be unable to process your repair order.

You will find the form in the appendix of these instructions, or simply request it by e-mail:

**[service@buehler-technologies.com](mailto:service@buehler-technologies.com)**.

### 7.1 Troubleshooting
















Problem / Malfunction	Possible cause	Action
Condensate inside the gas outlet	– Condensate trap full	– Empty condensate trap
	– Valve inside the automatic condensate drain may be stuck	– Flush in both directions
	– Cooler overloaded	– Maintain limits
Reduced gas flow rate	– Gas circuit clogged	– Uninstall and clean heat exchanger – if necessary, replace filter element
	– Condensate outlet iced over	– Send in unit
Excess temperature	– Operating point not yet reached	– Wait (max. 20 min)
	– Cooling outlet too long despite the cooler running	– Be sure the vents are not covered (heat buildup)
	– Flow rate / dew point / gas temperature too high	– Maintain limits / install pre-separator
	– Installed fan stopped	– Check and replace if necessary
Insufficient temperature	– Faulty control	– Send in cooler






## 7.1.1 Error messages on the display

If an error occurs, the display will read "Err". Press the "▲" button to show the error number(s).

Error messages will appear until the unit has been restarted or the error is cleared using the "Func" button. It can only be cleared if the cause for the error has been corrected.

**Causes / Action: The following is a list of the most common causes and actions for the respective error. If the actions listed do not resolve the problem, please contact Service.**

Problem/malfunction	Possible cause	Action
No display	<ul style="list-style-type: none"> <li>– No voltage</li> <li>– Loose connecting cable</li> <li>– Display failure</li> </ul>	<ul style="list-style-type: none"> <li>– Check the supply cable</li> <li>– Check fuse</li> <li>– Check connections</li> </ul>
 D1.02 (permanent)	(The software version for the display will appear). <ul style="list-style-type: none"> <li>– Not communicating with the controller</li> </ul>	<ul style="list-style-type: none"> <li>– Check connections</li> </ul>
 Error	<ul style="list-style-type: none"> <li>– An error has occurred</li> </ul>	<ul style="list-style-type: none"> <li>– Read the error number as described above</li> </ul>
 Error 01	<ul style="list-style-type: none"> <li>– Controller malfunction</li> </ul>	<ul style="list-style-type: none"> <li>– Clear error (temporary fault)</li> <li>– Disconnect from power for approx. 5 s</li> <li>– Contact service</li> </ul>
	<ul style="list-style-type: none"> <li>– Malfunction controller 2</li> </ul>	<ul style="list-style-type: none"> <li>– Clear error (temporary fault)</li> <li>– Disconnect from power for approx. 5 s</li> <li>– Contact service</li> </ul>
 Error 03	<ul style="list-style-type: none"> <li>– Microcontroller fault / MCP2</li> </ul>	<ul style="list-style-type: none"> <li>– Contact service</li> </ul>
 Error 04	<ul style="list-style-type: none"> <li>– EEPROM error</li> </ul>	<ul style="list-style-type: none"> <li>– Contact service</li> </ul>
	<ul style="list-style-type: none"> <li>– Fan malfunction / fan out of order</li> </ul>	<ul style="list-style-type: none"> <li>– Check fan (blocked?)</li> <li>– Check connection</li> </ul>
 Error 22	<ul style="list-style-type: none"> <li>– Moisture detector 1 cable break</li> </ul>	<ul style="list-style-type: none"> <li>– Check moisture detector line</li> <li>– Check moisture detector</li> </ul>
 Error 32	<ul style="list-style-type: none"> <li>– Moisture detector 2 cable break</li> </ul>	<ul style="list-style-type: none"> <li>– Check moisture detector line</li> <li>– Check moisture detector</li> </ul>
 Error 40	<ul style="list-style-type: none"> <li>– General error temperature sensor 1 (block temperature)</li> </ul>	<ul style="list-style-type: none"> <li>– Possible sensor failure</li> </ul>
 Error 41	<ul style="list-style-type: none"> <li>– Low temperature / short-circuit temperature sensor 1</li> </ul>	<ul style="list-style-type: none"> <li>– Check temperature sensor connection</li> </ul>
 Error 42	<ul style="list-style-type: none"> <li>– Excess temperature / short-circuit temperature sensor 1</li> </ul>	<ul style="list-style-type: none"> <li>– Check temperature sensor connection</li> </ul>
 Error 43	<ul style="list-style-type: none"> <li>– Measurement fluctuation temperature sensor 1</li> </ul>	<ul style="list-style-type: none"> <li>– Check temperature sensor connection</li> </ul>
 Error 50	<ul style="list-style-type: none"> <li>– General error temperature sensor 2 (pre-cooling stage block temperature)</li> </ul>	<ul style="list-style-type: none"> <li>– Possible sensor failure</li> </ul>
 Error 51	<ul style="list-style-type: none"> <li>– Low temperature / short-circuit temperature sensor 2</li> </ul>	<ul style="list-style-type: none"> <li>– Check temperature sensor connection</li> </ul>
 Error 52	<ul style="list-style-type: none"> <li>– Excess temperature / short-circuit temperature sensor 2</li> </ul>	<ul style="list-style-type: none"> <li>– Check temperature sensor connection</li> </ul>
 Error 53	<ul style="list-style-type: none"> <li>– Measurement fluctuation temperature sensor 2</li> </ul>	<ul style="list-style-type: none"> <li>– Check temperature sensor connection</li> </ul>

Status text	Possible cause	Action
 H2o.1	– Moisture alarm moisture detector 1	– Dry – Check condensate trap
 init	– Initialisation phase	– Wait
 PuMP	– Pumps deactivated	– Reactive pumps via menu
 dt	Active Delta T control only: The block temperature is outside the defined temperature range. – Cooler is still in the "break-in phase" – Fluctuating ambient temperature – Insufficient cooling capacity	– Wait to see if the target temperature will be reached – Check the ambient temperature / power supplied – Process-related: Adjust alarm limits
 (Flashing)	– Excess/low temperature	– see chapter "Troubleshooting"

## 7.2 Safety instructions

- The device must be operated within its specifications.
- All repairs must be carried out by Bühler authorised personnel only.
- Only perform modifications, servicing or mounting described in this manual.
- Only use original spare parts.

### DANGER

#### Electrical voltage

Electrocution hazard.



- Disconnect the device from power supply.
- Make sure that the equipment cannot be reconnected to mains unintentionally.
- The device must be opened by trained staff only.
- Regard correct mains voltage.



### DANGER

#### Toxic, corrosive gas/condensate

Sample gas/condensate may be hazardous to health.



- If necessary, ensure a safe gas/condensate discharge.
- Always disconnect the gas supply when performing maintenance or repairs.
- Protect yourself from toxic/corrosive gasses/condensate when performing maintenance. Wear appropriate protective equipment.



### CAUTION

#### Health hazard if the heat exchanger leaks

The heat exchanger is charged with glycol-based coolant.  
In the event of a heat exchanger leak:



- Avoid contact with the skin and eyes.
- In the event of a leak, do not restart the cooler under any circumstances. The cooler must be repaired by the manufacturer.

## 7.3 Cleaning and removal of the heat exchanger

Heat exchangers only need to be replaced or maintained if clogged or damaged. If they are clogged, we recommend checking if using a filter will avoid future occurrences.

- Close gas supply.
- Switch off device and disconnect all plugs (e.g. status output connector, supply input, etc.).
- Disconnect gas connections and condensate drain.
- Pull the heat exchanger up and out.
- Clean cleaning nest (hole inside the cooler block), as the heat exchangers are installed with silicone grease.
- Flush the heat exchanger until all contaminants have been removed.
- Grease the cooled outside surface external surface with silicone grease.
- Reinsert the heat exchanger into the cooling nest with a rotating movement.
- Reconnect the gas supply and condensate drain. The gas inlet is marked red.
- Restore power/gas supply and wait for unit to be ready for operation.
- Open gas supply.

## 7.4 Replacing the hoses of the peristaltic pump (option)

- Close gas supply.
- Switch off device and disconnect all plugs (e.g. connector plug status output, supply input, etc.).
- Disconnect supply and discharge tube on peristaltic pump (**observe safety notes!**).
- Loosen but do not remove centre knurled nut. Flip down the screw.
- Pull cover up and off.
- Unplug external connections and remove hose.
- Replace hose (Bühler spare part) and install peristaltic pump in reverse order.
- Restore the power and gas supply.

## 7.5 Replacing the filter element (option)

### CAUTION



### Gas leakage

The filter should not be dismantled under pressure.  
Don't use damaged parts again.

- Close the gas supply.
- Switch off and unplug the device.
- Pull the bracket, holding on to the filter glass.
- Whilst holding the filter head, move the glass back and forth and carefully remove downward.
- Remove the filter element and insert a new one.
- Check for leaks and replace, if necessary.
- Whilst holding the filter head, move the glass back and forth and carefully reattach the filter head, attach the bracket, and ensure it is seated securely.
- Restore the power and gas supply.

**NOTICE!** Please observe legal regulations when disposing of filter elements.

## 7.6 Drying of the moisture detector (option)

The moisture detector must be dried if moisture enters.

- Close the gas supply.
- Switch off and unplug the device.
- Loosen the swivel nut for the moisture detector connection line and disconnect the line.
- Unscrew the moisture detector counter-clockwise and remove.
- Dry moisture detector.
- Reinsert the moisture detector and carefully tighten the screw connection.
- Connect the connection line and tighten the swivel nut.
- Restore the power and gas supply.

## 7.7 Calibration of the moisture detector (option)

- When replacing the moisture detectors, they must be recalibrated.
- Be sure dry gas flows through the cooler.
- Select cooler menu and confirm.



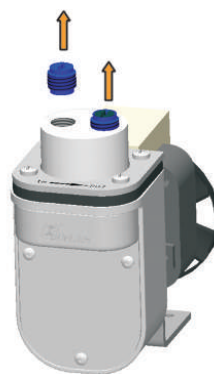
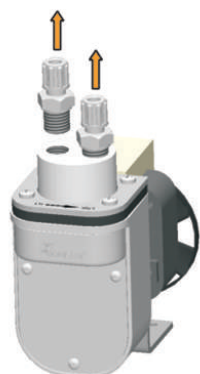
- Select menu item moisture detector.



- The display shows (Reset).
- Confirm the display to calibrate the moisture detectors.

**For a detailed overview of menu navigation, refer to chapter "Operation and Control".**

## 7.8 Replacing sample gas pump inlet and outlet valves (optional)



First detach the screw connections.

Unscrew the inlet or outlet valve with a wide slot screwdriver.

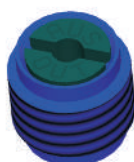
**Attention:** The PVDF and PVDF with bypass valve pump bodies already have PTFE gaskets installed in the gas inlets and outlets. These are also included in the valve spare parts kit. Remove the old gaskets before installing the new ones.

The inlet and outlet valves are identical. Their installation position determines the function. As shown in the image, the valves are blue on one side and black on the other. The valves are further marked "IN" or for inlet and "OUT" for outlet.

Inlet valve



Outlet valve

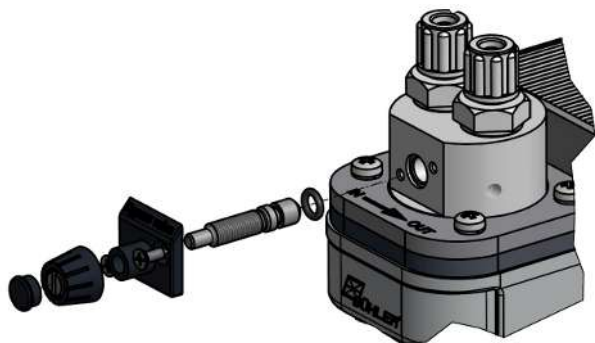


To assemble the sample gas pump, perform the steps in reverse order. When tightening the inlet and outlet valves be sure to observe the required tightening torque of max. 1 Nm. **CAUTION! Tightening the valves more will permanently deform the pump body, requiring replacement.**

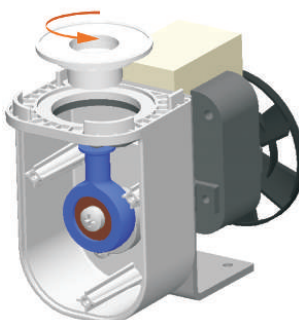
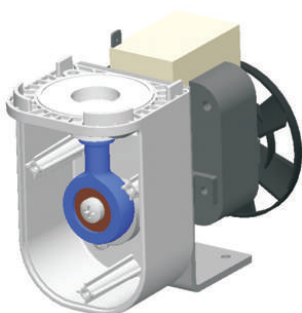
When installing the screw connection, ensure the connection is tight.

## 7.9 Replacing the O-ring on the bypass valve (optional)

- Loosen the two screws on the valve plate and carefully remove the entire unit.
- Coat the new O-ring with suitable O-ring grease (min. operating temperature 145 °C, e.g. Fluoronox S90/2) and install in the spindle.
- Carefully insert the entire unit into the pump body while turning and tighten screws.



## 7.10 Replacing the bellow (optional)



To replace the bellow carefully unscrew it from the connecting rod counter clockwise. Be sure not to lose any installed shims.

Before reinstalling the bellow be sure it is not damaged.

Reinstall hand tight in reverse order.



## 7.11 Spare Parts

Please also specify the model and serial number when ordering parts.

Upgrade and expansion parts can be found in our catalog.

Available spare parts:

Item no.	Description
9100100007	Display module MCD400
9144050080	Controller board display module connecting cable, 400 mm
9144050091	Connecting cable, main boards
9100130380	Microcontroller board MCP2.2
9100132380	Microcontroller board MCP2.2 ADON
4011000	Flow adapter type G, PVDF G1/4
40110001	Flow adapter type NPT, PVDF NPT 1/4"
4011005	Flow adapter type G, stainless steel, G 1/4
40110051	Flow adapter type NPT, stainless steel, NPT 1/4"
4111100	Moisture detector FF-3-N, without cable
9144050081	Moisture detector connection cable, 300 mm
9144050082	Moisture detector connection cable, 450 mm
449600062	Fan, 12 V DC with status output
9100010198	Power board
9100011187	Controller board
see data sheet 450020	Peristaltic Pumps CPsingle CPdouble
see data sheet 450011	Sample Gas Pumps P1

### 7.11.1 Consumables and accessories

Item no.	Description
4510008	Automatic condensate drain AK 5.2 (pressure operation only)
4510028	Automatic condensate drain AK 5.5 (pressure operation only)
4410004	Automatic condensate drain AK 20 (pressure operation only)
4410001	Automatic condensate drain 11 LD V 38 (pressure operation only)
41030050	Replacement filter element F2; 5-pack
9144050038	Cable for cooler temperature analog output 4 m
4410005	Condensate trap GL1, 0.4 L
44920035012	Condensate pump replacement hose, Tygon (Norpren), angled hose nipple
44920035016	Condensate pump replacement hose, Tygon (Norpren), angled hose nipple and screw connection (metric)
44920035017	Condensate pump replacement hose, Tygon (Norpren), angled hose nipple and screw connection (US)
4228003	Bellow for P1 pump
9009398	O-ring for bypass P1 pump
4228066	Set inlet/outlet valves 70 °C for P1 pump

## 8 Disposal

The heat exchanger is charged with glycol-based coolant.

The applicable national laws must be observed when disposing of the products. Disposal must not result in a danger to health and environment.

The crossed out wheelie bin symbol on Bühler Technologies GmbH electrical and electronic products indicates special disposal notices within the European Union (EU).



The crossed out wheelie bin symbol indicates the electric and electronic products bearing the symbol must be disposed of separate from household waste. They must be properly disposed of as waste electrical and electronic equipment.

Bühler Technologies GmbH will gladly dispose of your device bearing this mark. Please send your device to the address below for this purpose.



We are obligated by law to protect our employees from hazards posed by contaminated devices. Therefore please understand that we can only dispose of your waste equipment if the device is free from any aggressive, corrosive or other operating fluids dangerous to health or environment. **Please complete the "RMA Form and Decontamination Statement", available on our website, for every waste electrical and electronic equipment. The form must be applied to the packaging so it is visible from the outside.**

Please return waste electrical and electronic equipment to the following address:

Bühler Technologies GmbH  
WEEE  
Harkortstr. 29  
40880 Ratingen  
Germany

Please also observe data protection regulations and remember you are personally responsible for the returned waste equipment not bearing any personal data. Therefore please be sure to delete your personal data before returning your waste equipment.

## 9 Appendices

### 9.1 Gas Cooler Technical Data

Gas Cooler Technical Data				
Ready for operation	after max. 10 minutes			
Ambient temperature	5 °C to 60 °C			
Gas output dew temperature, preset: adjustable:	5 °C 2 °C...20 °C			
IP rating	IP 20			
Housing	Stainless steel, brushed			
Packaging dimensions	approx. 427 x 300 x 293 mm			
Weight incl. heat exchanger	approx. 11.5 kg approx. 15 kg at full expansion stage			
Electrical data	Unit without add-on		Unit with add-on (peristaltic pump + gas pump)	
	<b>230 V AC</b>	<b>115 V AC</b>	<b>230 V AC</b>	<b>115 V AC</b>
	+5/-10%	+5/-10%	+5%	+5%
	50/60 Hz	50/60 Hz	50 Hz	60 Hz
	1.6 A	3.2 A	2.1 A	4.1 A
	278 W / 350 VA	296 W / 370 VA	390 W / 487 VA	377 W / 472 VA
Recommended fuse (characteristic: delayed action)	2.5 A	4 A	2.5 A	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	Heat exchange see table "Heat Exchanger Overview" Filter, moisture detector adapter, gas pump, G1/4 or NPT 1/4" or metric/US tube or pipe			
Parts in contact with media Filter: Moisture detector: Heat exchanger: Peristaltic pump: Tubing:	see "Technical Data - Options" see "Technical Data - Options" see table "Heat Exchanger Overview" see "Technical Data - Options" PTFE/Viton			
FM no.:	3062014			

### 9.2 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

#### Technical Data FF-3-N Moisture Detector

Ambient temperature	3 °C to 50 °C
max. operating pressure with FF-3-N	2 bar
Material	PVDF, PTFE, epoxy resin, stainless steel 1.4571, 1.4576

### CPdouble Peristaltic Pump Technical Data

Ambient temperature	0 °C to 55 °C
Flow rate	0.3 L/h (50 Hz) / 0.36 L/h (60 Hz) with standard hose
Vacuum inlet	max. 0.8 bar
Pressure inlet	max. 1 bar
Outlet pressure	1bar
Hose	4 x 1.6 mm
Degree of protection	IP 44
Materials	
Hose:	Norprene (standard), Marprene, Fluran
Connections:	PVDF

### Technical Data Sample Gas Pump P1

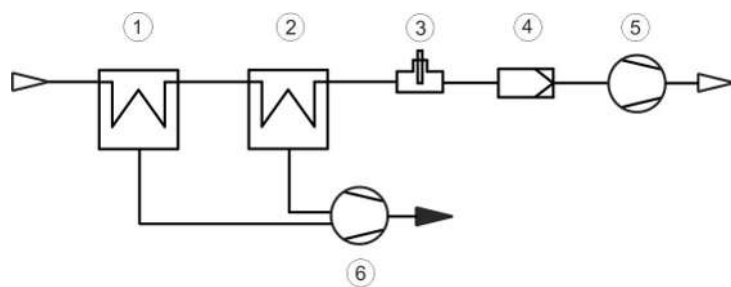
Ambient temperature	0 °C to 50 °C
Operating pressure	max. 1,3 bar abs.
Nominal outlet	280 l/h (at p = 1 bar abs.)
Materials in contact with media vary by configuration	PTFE, PVDF, 1.4571, 1.4401, Viton, PFA

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

Ambient temperature	3 °C to 100 °C
max. operating pressure with filter	4 bar
Filter surface	60 cm <sup>2</sup>
Filter fineness	2 µm
Dead volume	57 ml
Materials	
Filter:	PVDF, Duran glass (parts in contact with media)
Seal:	Viton
Filter element:	sintered PTFE

## 9.3 Flow chart

### Flow chart:

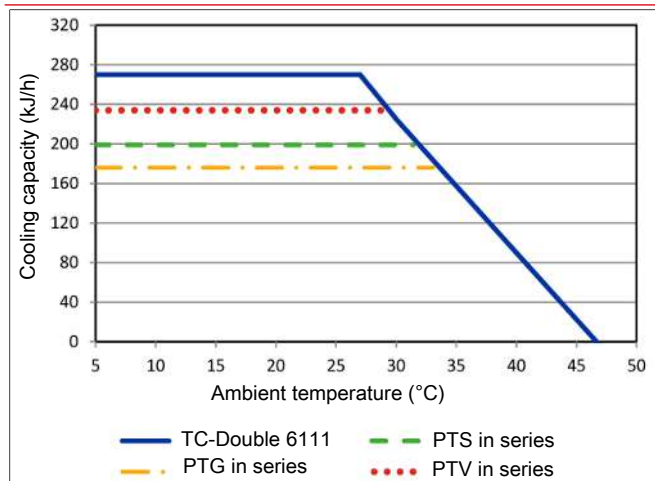


1 Heat exchanger 2 / pre-cooling	4 Filter (optional)
2 Heat exchanger 1 / after-cooling	5 Sample gas pump (optional)
3 Moisture detector (option)	6 Condensate pump (optional)

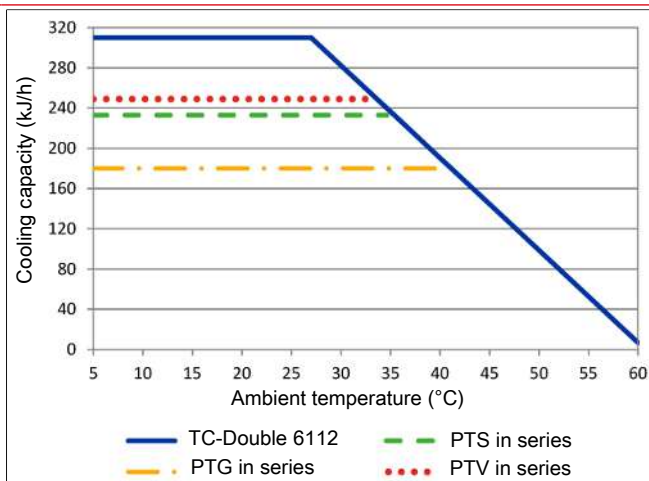
## 9.4 Performance curves

The TC-Double 6111 (X2) is designed for ambient temperatures of up to 40 °C. The cooling capacity is adequate up to this temperature. The TC-Double 6112 (X2) on the other hand can be used in higher temperatures up to nominal 60 °C. Please note the available cooling capacity.

**Model TC-Double 6111 (X2)**



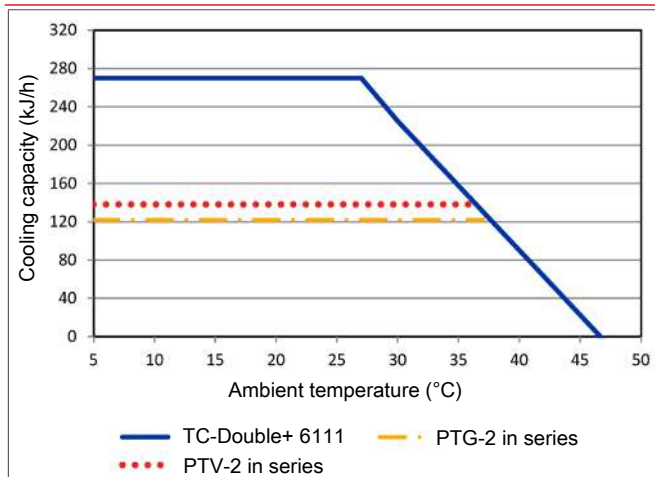
**Model TC-Double 6112 (X2)**



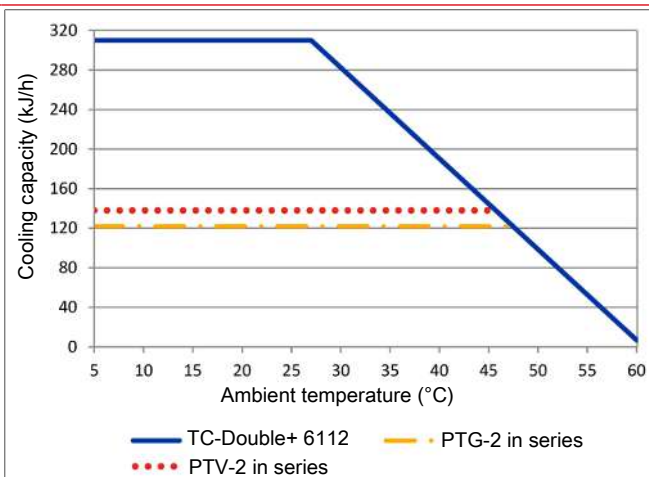
Note: The limit curves for the heat exchangers exchanger apply to a dew point of 50 °C.

The TC-Double+ 6111 (X2) is designed for ambient temperatures of up to 40 °C. The cooling capacity is adequate up to this temperature. The TC-Double+ 6112 (X2) on the other hand can be used in higher temperatures up to nominal 60 °C. Please note the available cooling capacity.

**Model TC-Double+ 6111 (X2)**



**Model TC-Double+ 6112 (X2)**



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

## 9.5 Heat exchanger

### 9.5.1 Heat exchanger description

The energy content of the sample gas and the required cooling capacity of the gas cooler is determined by three parameters: gas temperature  $\vartheta_G$ , dew point  $\tau_e$  (moisture content) and volume flow  $v$ . The outlet dew point rises with increasing energy content of the gas. The following limits for the maximum flow are specified for a standard operating point of  $\tau_e = 50^\circ\text{C}$  and  $\vartheta_G = 70^\circ\text{C}$ . Indicated is the maximum flow  $v_{\max}$  in NI/h of cooled air, 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 design program.

### 9.5.2 Heat exchanger overview

#### TC-Double

Heat exchanger	2x PTS 2x PTS-I <sup>2)</sup>	2x PTG 2x PTG-I <sup>2)</sup>	2x PTV 2x PTV-I <sup>2)</sup>
Materials in contact with media	Stainless steel	Glass PTFE	PVDF
Flow rate $v_{\max}$ <sup>1)</sup>	450 NI/h	250 NI/h	250 NI/h
Inlet dew point $\tau_{e,\max}$ <sup>1)</sup>	70 °C	70 °C	70 °C
Gas inlet temperature $\vartheta_{G,\max}$ <sup>1)</sup>	180 °C	140 °C	140 °C
Max. Cooling capacity $Q_{\max}$	310 kJ/h	215 kJ/h	295 kJ/h
Gas pressure $p_{\max}$	3 bar <sup>4)</sup>	3 bar	2 bar
Pressure drop $\Delta p$ ( $v=150\text{ L/h}$ ) total	20 mbar	20 mbar	20 mbar
Dead volume $V_{\text{tot}}$ total	59 ml	59 ml	115 ml
Gas connections (metric)	6 mm	GL 14 (6 mm) <sup>3)</sup>	DN 4/6
Gas connections (US)	1/4"	GL 14 (1/4") <sup>3)</sup>	1/4"-1/6"
Condensate out connections (metric)	G3/8	GL 25 (12 mm) <sup>3)</sup>	G3/8
Condensate out connections (US)	NPT 3/8"	GL 25 (1/2") <sup>3)</sup>	NPT 3/8"

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

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

<sup>3)</sup> Gasket inside diameter.

<sup>4)</sup> 160 bar on request.

#### TC-Double+

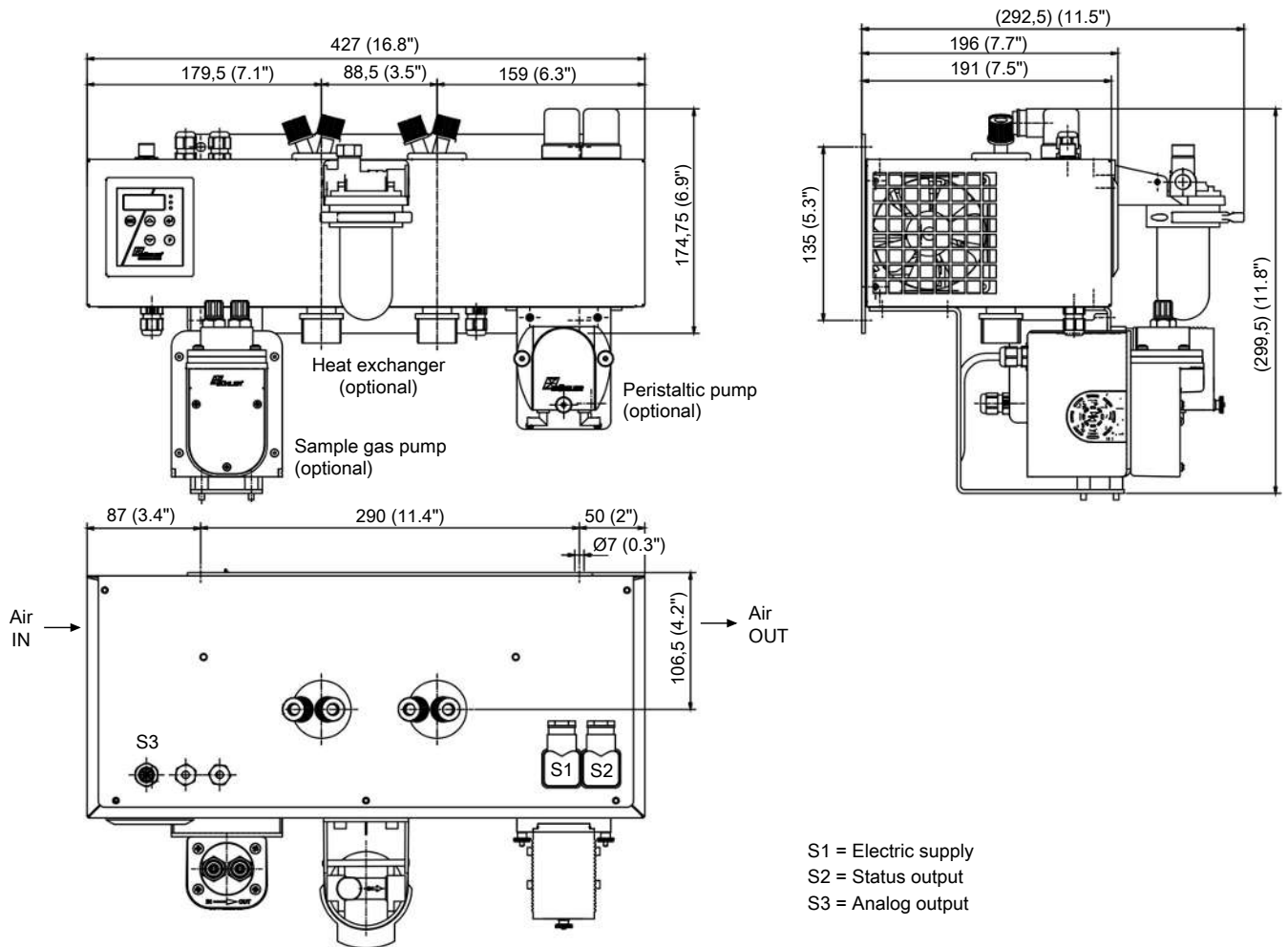
Heat exchanger	2x PTG-2 2x PTG-2-I <sup>2)</sup>	2x PTV-2 2x PTV-2-I <sup>2)</sup>
Materials in contact with media	Glass PTFE	PVDF
Flow rate $v_{\max}$ <sup>1)</sup>	250 NI/h	250 NI/h
Inlet dew point $\tau_{e,\max}$ <sup>1)</sup>	70 °C	70 °C
Gas inlet temperature $\vartheta_{G,\max}$ <sup>1)</sup>	140 °C	140 °C
Max. Cooling capacity $Q_{\max}$	230 kJ/h	215 kJ/h
Gas pressure $p_{\max}$	3 bar	2 bar
Pressure drop $\Delta p$ ( $v=150\text{ L/h}$ ) total	20 mbar	20 mbar
Dead volume $V_{\text{tot}}$ total	59 ml	115 ml
Gas connections (metric)	GL 14 (6 mm) <sup>3)</sup>	DN 4/6
Gas connections (US)	GL 14 (1/4") <sup>3)</sup>	1/4"-1/6"
Condensate out connections (metric)	GL 25 (12 mm) <sup>3)</sup>	G3/8
Condensate out connections (US)	GL 25 (1/2") <sup>3)</sup>	NPT 3/8"

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

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

<sup>3)</sup> Gasket inside diameter.

## 9.6 Dimensions (mm)



## **10 Attached documents**

- RMA – Decontamination Statement



# RMA-Formular und Erklärung über Dekontaminierung

## RMA-Form and explanation for decontamination



RMA-Nr./ RMA-No.

Die RMA-Nr. bekommen Sie von Ihrem Ansprechpartner im Vertrieb oder Service. Bei Rücksendung eines Altgeräts zur Entsorgung tragen Sie bitte in das Feld der RMA-Nr. "WEEE" ein./ You may obtain the RMA number from your sales or service representative. When returning an old appliance for disposal, please enter "WEEE" in the RMA number box.

Zu diesem Rücksendeschein gehört eine Dekontaminierungserklärung. Die gesetzlichen Vorschriften schreiben vor, dass Sie uns diese Dekontaminierungserklärung ausgefüllt und unterschrieben zurücksenden müssen. Bitte füllen Sie auch diese im Sinne der Gesundheit unserer Mitarbeiter vollständig aus./ This return form includes a decontamination statement. The law requires you to submit this completed and signed decontamination statement to us. Please complete the entire form, also in the interest of our employee health.

### Firma/ Company

Firma/ Company

Straße/ Street

PLZ, Ort/ Zip, City

Land/ Country

Gerät/ Device

Anzahl/ Quantity

Auftragsnr./ Order No.

### Ansprechpartner/ Person in charge

Name/ Name

Abt./ Dept.

Tel./ Phone

E-Mail

Serien-Nr./ Serial No.

Artikel-Nr./ Item No.

### Grund der Rücksendung/ Reason for return

- ☐ Kalibrierung/ Calibration ☐ Modifikation/ Modification  
☐ Reklamation/ Claim ☐ Reparatur/ Repair  
☐ Elektroaltgerät/ Waste Electrical & Electronic Equipment (WEEE)  
☐ andere/ other

bitte spezifizieren/ please specify

### Ist das Gerät möglicherweise kontaminiert?/ Could the equipment be contaminated?

- ☐ Nein, da das Gerät nicht mit gesundheitsgefährdenden Stoffen betrieben wurde./ No, because the device was not operated with hazardous substances.  
☐ Nein, da das Gerät ordnungsgemäß gereinigt und dekontaminiert wurde./ No, because the device has been properly cleaned and decontaminated.  
☐ Ja, kontaminiert mit:/ Yes, contaminated with:



☐  
explosiv/  
explosive



☐  
entzündlich/  
flammable



☐  
brandfördernd/  
oxidizing



☐  
komprimierte  
Gase/  
compressed  
gases



☐  
ätzend/  
caustic



☐  
giftig,  
Lebensgefahr/  
poisonous, risk  
of death



☐  
gesundheitsge-  
fährdend/  
harmful to  
health



☐  
gesund-  
heitsschädlich/  
health hazard



☐  
umweltge-  
fährdend/  
environmental  
hazard

### Bitte Sicherheitsdatenblatt beilegen! / Please enclose safety data sheet!

Das Gerät wurde gespült mit:/ The equipment was purged with:

Diese Erklärung wurde korrekt und vollständig ausgefüllt und von einer dazu befugten Person unterschrieben. Der Versand der (dekontaminierten) Geräte und Komponenten erfolgt gemäß den gesetzlichen Bestimmungen.

This declaration has been filled out correctly and completely, and signed by an authorized person. The dispatch of the (decontaminated) devices and components takes place according to the legal regulations.

Falls die Ware nicht gereinigt, also kontaminiert bei uns eintrifft, muss die Firma Bühler sich vorbehalten, diese durch einen externen Dienstleister reinigen zu lassen und Ihnen dies in Rechnung zu stellen.

Should the goods not arrive clean, but contaminated, Bühler reserves the right, to commission an external service provider to clean the goods and invoice it to your account.

Firmenstempel/ Company Sign

Datum/ Date

rechtsverbindliche Unterschrift/ Legally binding signature



### **Vermeiden von Veränderung und Beschädigung der einzusendenden Baugruppe**

Die Analyse defekter Baugruppen ist ein wesentlicher Bestandteil der Qualitätssicherung der Firma Bühler Technologies GmbH. Um eine aussagekräftige Analyse zu gewährleisten muss die Ware möglichst unverändert untersucht werden. Es dürfen keine Veränderungen oder weitere Beschädigungen auftreten, die Ursachen verdecken oder eine Analyse unmöglich machen.

### **Umgang mit elektrostatisch sensiblen Baugruppen**

Bei elektronischen Baugruppen kann es sich um elektrostatisch sensible Baugruppen handeln. Es ist darauf zu achten, diese Baugruppen ESD-gerecht zu behandeln. Nach Möglichkeit sollten die Baugruppen an einem ESD-gerechten Arbeitsplatz getauscht werden. Ist dies nicht möglich sollten ESD-gerechte Maßnahmen beim Austausch getroffen werden. Der Transport darf nur in ESD-gerechten Behältnissen durchgeführt werden. Die Verpackung der Baugruppen muss ESD-konform sein. Verwenden Sie nach Möglichkeit die Verpackung des Ersatzteils oder wählen Sie selber eine ESD-gerechte Verpackung.

### **Einbau von Ersatzteilen**

Beachten Sie beim Einbau des Ersatzteils die gleichen Vorgaben wie oben beschrieben. Achten Sie auf die ordnungsgemäße Montage des Bauteils und aller Komponenten. Versetzen Sie vor der Inbetriebnahme die Verkabelung wieder in den ursprünglichen Zustand. Fragen Sie im Zweifel beim Hersteller nach weiteren Informationen.

### **Einsenden von Elektroaltgeräten zur Entsorgung**

Wollen Sie ein von Bühler Technologies GmbH stammendes Elektroprodukt zur fachgerechten Entsorgung einsenden, dann tragen Sie bitte in das Feld der RMA-Nr. „WEEE“ ein. Legen Sie dem Altgerät die vollständig ausgefüllte Dekontaminierungserklärung für den Transport von außen sichtbar bei. Weitere Informationen zur Entsorgung von Elektroaltgeräten finden Sie auf der Webseite unseres Unternehmens.

### **Avoiding alterations and damage to the components to be returned**

Analysing defective assemblies is an essential part of quality assurance at Bühler Technologies GmbH. To ensure conclusive analysis the goods must be inspected unaltered, if possible. Modifications or other damages which may hide the cause or render it impossible to analyse are prohibited.

### **Handling electrostatically conductive components**

Electronic assemblies may be sensitive to static electricity. Be sure to handle these assemblies in an ESD-safe manner. Where possible, the assemblies should be replaced in an ESD-safe location. If unable to do so, take ESD-safe precautions when replacing these. Must be transported in ESD-safe containers. The packaging of the assemblies must be ESD-safe. If possible, use the packaging of the spare part or use ESD-safe packaging.

### **Fitting of spare parts**

Observe the above specifications when installing the spare part. Ensure the part and all components are properly installed. Return the cables to the original state before putting into service. When in doubt, contact the manufacturer for additional information.

### **Returning old electrical appliances for disposal**

If you wish to return an electrical product from Bühler Technologies GmbH for proper disposal, please enter "WEEE" in the RMA number box. Please attach the fully completed decontamination declaration form for transport to the old appliance so that it is visible from the outside. You can find more information on the disposal of old electrical appliances on our company's website.

