



# Instruction Manual



## **Controlled Evaporator and Mixer (CEM)**

Doc. no.: 9.17.126A Date: 02-10-2018



### **ATTENTION**

**Please read this Instruction Manual carefully before installing and operating the instrument.  
Not following the guidelines could result in personal injury and/or damage to the equipment.**



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## Symbols



*Important information. Disregarding this information could cause injuries to people or damage to the instrument or installation.*



*Helpful information. This information will facilitate the use of the instrument and/or contribute to its optimal performance.*



*Additional info available on the internet or from your local Bronkhorst representative.*

## Receipt of equipment

Check the outside package box for damage incurred during shipment. If the box is damaged, then the local carrier must be notified at once regarding his liability, if so required. At the same time a report should be submitted to your local Bronkhorst representative.

Carefully remove the equipment from the box. Verify that the contents of the package was not damaged during shipment. Should the equipment be damaged, then the local carrier must be notified at once regarding his liability, if so required. At the same time a report should be submitted to your local Bronkhorst representative.



- *Check the packing list to ensure that you received all of the items included in the scope of delivery*
- *Do not discard spare or replacement parts with the packaging material*

Refer to [Removal and return instructions](#) about return shipment procedures.

## Equipment storage

The equipment should be stored in its original package in a cupboard warehouse or similar. Care should be taken not to subject the equipment to excessive temperatures or humidity.

## Warranty

Bronkhorst® products are warranted against defects in material and workmanship for a period of three years from the date of shipment, provided they are used in accordance with the ordering specifications and not subject to abuse or physical damage. Products that do not operate properly during this period may be repaired or replaced at no charge. Repairs are normally warranted for one year or the balance of the original warranty, whichever is the longer.



See also section 9 (Guarantee) of the Conditions of sales:  
[www.bronkhorst.com/about/conditions-of-sales/](http://www.bronkhorst.com/about/conditions-of-sales/)

The warranty includes all initial and latent defects, random failures, and indeterminable internal causes.

It excludes failures and damage caused by the customer, such as contamination, improper electrical hook-up, physical shock etc.

Re-conditioning of products primarily returned for warranty service that is partly or wholly judged non-warranty may be charged for.

Bronkhorst High-Tech B.V. or affiliated company prepays outgoing freight charges when any part of the service is performed under warranty, unless otherwise agreed upon beforehand, however, if the product has been returned collect to our factory or service center, these costs are added to the repair invoice. Import and/or export charges, foreign shipping methods/carriers are paid by the customer.

## General safety precautions

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

Before operating, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables for cracks or breaks before each use.

The equipment and accessories must be used in accordance with their specifications and operating instructions, otherwise the safety of the equipment may be impaired.

If required, replace fuses with the same type and rating for continued protection against fire hazard.

Opening the equipment is not allowed. There are no user serviceable parts inside. In case of a defect please return the equipment to Bronkhorst High-Tech B.V.

One or more warning signs may be present on different parts of the product. These signs have the following meaning:



*Consult the instruction manual for handling instructions*



*Surface may get hot during operation*



*Shock hazard; electrical parts inside*

To maintain protection from electric shock and fire, replacement components must be obtained from Bronkhorst. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be obtained from other suppliers, as long as they are equivalent to the original component. Selected parts should be obtained only through Bronkhorst, to maintain accuracy and functionality of the product. If you are unsure about the relevance of a replacement component, contact your local Bronkhorst representative for information.



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# 1 Introduction

## 1.1 Scope of this manual

This manual contains general product information, installation and operating instructions and troubleshooting tips for the Bronkhorst® **Controlled Evaporator and Mixer** (CEM).



## 1.2 Intended use

The Bronkhorst® CEM is designed for mass flow control of vapours created from liquid and gas, using the media and operating conditions (e.g. temperature, pressure) as specified at ordering time.

The equipment is suited for general purpose indoor (dry) applications, like laboratories and machine enclosures.



*The end user is considered to be familiar with the necessary safety precautions, and to comply with the appropriate protective measures as described in the Material Safety Data Sheets of the media to be used in the system (if applicable).*



*The wetted materials incorporated in the CEM are compatible with media and conditions (e.g. pressure, temperature) as specified at ordering time. If you are planning to use the product (including any third party components supplied by Bronkhorst, such as pumps or valves) with other media and/or other conditions, always check the wetted materials (including seals) for compatibility. See the technical specifications of the product and consult third party documentation (if applicable) to check the incorporated materials.*

*Responsibility for the use of the equipment with regard to suitability, intended use, cleaning and corrosion resistance of the used materials against the applied media lies solely with the end user. Bronkhorst High-Tech B.V. cannot be held liable for any damage resulting from improper use, use for other than the intended purpose or use with other media and/or under other conditions than specified on the purchase order.*

### 1.3 Product description

The CEM comprises a control valve (also called 'mixing valve'), a mixing chamber and a heat exchanger (see [product overview](#)), to add a liquid to a carrier gas and transform the mix into a vapour.

A complete CEM system is a modular setup with the CEM itself as the core component. To feed it with liquid and gas, the CEM is complemented with a liquid flow meter with control function (e.g. a mini CORI-FLOW or LIQUI-FLOW) and a gas flow controller (e.g. an EL-FLOW Select). The liquid flow meter uses the mixing valve of the CEM to control the liquid flow rate.

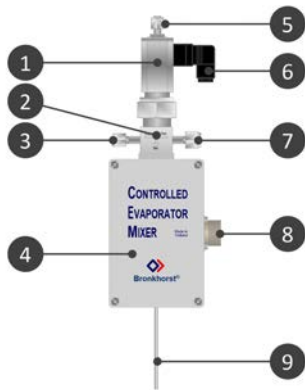


The gas serves as a mixing component and as a means of transport for the vapour, and is therefore also referred to as 'carrier gas'. The mixing valve atomizes the liquid and adds it to the carrier gas, creating an aerosol, which is heated by the CEM until it transforms into a vapour. To monitor the internal temperature of the heat exchanger, the CEM incorporates a PT100 temperature sensor. An internal safety switch prevents overheating of the heat exchanger, by interrupting the control signal as soon as the temperature reaches 200 °C.

To control the liquid and gas supply flows and the CEM temperature, Bronkhorst offers an E-8000 readout and control unit. This module contains a temperature controller for the heat exchanger and provides a user interface to operate the instrumentation. The E-8000 module also serves as a power supply unit and can be optionally equipped with a fieldbus interface for the CEM.

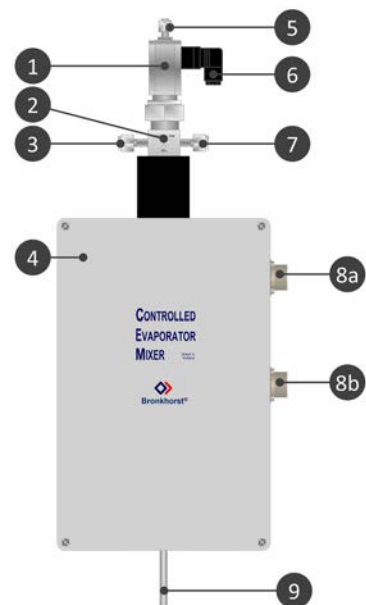
### 1.4 Product overview

W-10x / W-20x



1. Control valve
2. Mixing chamber
3. Liquid inlet
4. Heat exchanger
5. Bleed connection
6. Control valve actuator connection
7. Gas inlet
8. Power and signal connection
  - a. Signal
  - b. Power
9. Vapour outlet

W-30x





## 1.5 Documentation

The CEM comes with all necessary documentation for basic operation and maintenance. Some parts of this manual refer to other documents, which can be downloaded from the Bronkhorst website.

In addition to the CEM itself, a complete CEM system comprises other instruments and peripherals, which are not described in this manual. Consult the according manuals for installation and operation instructions.



The documentation listed in the following table is available on the **CEM** product pages under [www.bronkhorst.com/products](http://www.bronkhorst.com/products)

Type	Document name	Document no.
Brochures	CEM Brochure	9.60.038
Manuals	Instruction Manual Controlled Evaporator and Mixer (this document)	9.17.126
	Instruction manual E-8000	9.17.076
Hook-up diagrams	Hook-up diagram CEM W101A-W102A-W202A	9.16.086
	Hook-up diagram CEM W303B 120V	9.16.116
	Hook-up diagram CEM W303B 230V	9.16.115
Dimensional drawings	Dimensional drawing W-101A	7.05.585
	Dimensional drawing W-102A-W202A	7.05.574
	Dimensional drawing W-303B 115V-230V	7.05.902

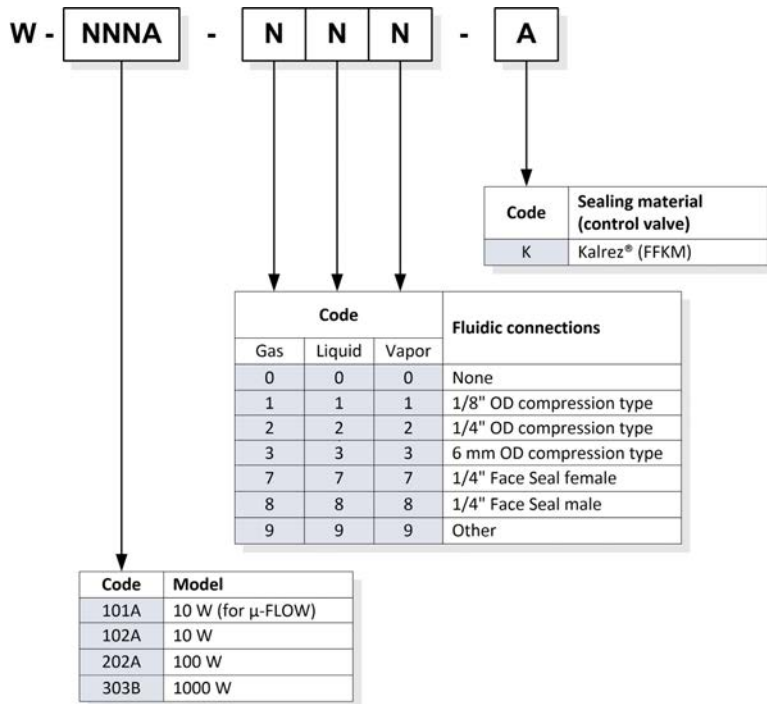


The documentation listed in the following table can be downloaded from [www.bronkhorst.com/downloads](http://www.bronkhorst.com/downloads) :

Type	Document	Document no.
General documentation	EU Declaration of Conformity	9.06.058

## 1.6 Model key

The model key on the serial number label contains information about the technical properties of the instrument as ordered. The actual properties of your instrument can be retrieved with the diagram below.

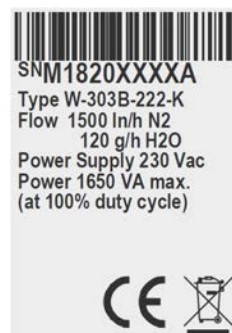


## 2 Installation

### 2.1 Functional properties

Before installing the CEM, check the serial number label to see if the functional properties match your requirements:

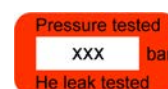
- Instrument type (technical properties; see [Model key](#))
- Flow rates (gas and liquid)
- Media to be used in the instrument
- Power supply



#### Test pressure



Bronkhorst® instruments are pressure tested to at least 1.5 times the specified working process conditions and outboard leak tested to at least  $2 * 10^{-9}$  mbar l/s Helium. The tested pressure is specified on the instrument with a red label.



- Before installation, make sure that the tested pressure is in accordance with the safety factor of your application
- If the pressure test label is missing or if the specified pressure is insufficient, the instrument must not be used and should be returned to the factory
- The maximum operating pressure must never exceed the tested pressure
- Disassembling the instrument and/or replacing parts of it will invalidate the pressure test specification.

### 2.2 Mounting



The CEM must be mounted vertically, with the control valve up and the vapour outlet pointing down (as shown in the [product overview](#)).



For optimal performance, please observe the following:

- Use the mounting holes on the rear to attach the CEM to a rigid and stable construction. Check the [dimensional drawing](#) for the exact positions and size of the mounting holes
- Avoid installation in close proximity of mechanical vibration and/or heat sources.

### 2.3 Electrical connection

Electrical connections must be made with standard cables or according to the applicable hook-up diagrams. Make sure that the power supply is suitable for the power ratings as indicated on the serial number label or in the technical specifications of the instrument, and that double or reinforced insulation is used for the power supply.



The device contains electronic components that are susceptible to damage by **electrostatic discharge**. Proper handling procedures must be followed during installation, (dis)connecting and removing the electronics.

The device described in this manual carries the CE-mark and is **compliant with the concerning EMC requirements**. However, compliance with the EMC requirements is not possible without the use of proper cables and connector/gland assemblies. Bronkhorst recommends the use of their standard cables. These cables have the right connectors and if loose ends are used, these are marked to help prevent wrong connection. When using other cables, cable wire diameters should be sufficient to carry the supply current, and voltage loss must be kept as low as possible. When in doubt, contact your local Bronkhorst representative.

When connecting the product to other devices, be sure that the integrity of the shielding is not affected; **always use shielded cabling for signals and communication and do not use unshielded wire terminals**.



Caution: when using the CEM without a Bronkhorst® readout and control unit (E-8000), observe the following guidelines:

- The heat exchanger is not suitable for constant AC power supply
- The heat exchanger should be incorporated in a temperature control circuit
- The CEM does not contain a fuse. Consult the hook-up diagram for the recommended fuse type to be used for the temperature control circuit
- The safety switch inside the heat exchanger is not part of the AC power supply circuit



The recommended maximum cable length between the CEM and the control unit is 5 m. The internal electrical resistance of the cable causes a deviation of the readout signal of the temperature sensor of the CEM (approximately 0.1 °C/m).

## 2.4 System assembly

### 2.4.1 Assembly tips



#### **Tubing length**

Because of the low flow rates fed to the CEM system, filling (and refreshing) the internal volume of the tubing can take a fair amount of time. It will also take some time for the vapour flow to settle after flow setpoints are changed (response delay). Fill time and response delay are affected mainly by the length and inside diameter of the tubing and the supported flow ranges of the flow meters/controllers.

By minimizing tubing lengths between the flow meters/controllers and the CEM, the filling/response time can be kept as short as possible. It can also reduce the impact of external disturbances like temperature, pressure and vibrations.



#### **Tubing diameter and flexibility**

- Use tubing with a minimal diameter that still supports the required media flow; this will help keep the filling and refreshing time of the fluidic lines as short as possible.
- Preferably use hard tubing (as opposed to flexible), to prevent internal volume changes and reduce the impact of ambient pressure fluctuations.



#### **Insulation and heat tracing**

Applying insulation material on the liquid and gas tubing can minimize the influence of ambient temperature gradients on the supply side of the CEM. Alternatively, mount the entire system in a thermal enclosure to minimize temperature influences from the environment.

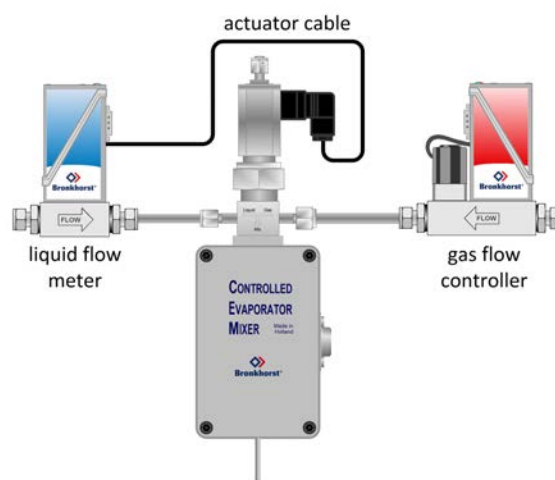


#### **Heat tracing**

The ambient conditions or adding extra gases to the vapour after the CEM outlet can cause the vapour to condensate before the process or further down the line. To prevent this, apply heat tracing tape or use heated tubing.

### 2.4.2 Basic assembly

- Connect the outlet of the liquid flow meter to the liquid inlet of the CEM (mind the FLOW arrow on the instrument base)
- Connect the outlet of the gas flow controller to the gas inlet of the CEM (mind the FLOW arrow on the instrument base)
- Connect the vapour outlet directly to the process/reactor/chamber
- Connect an actuator cable from the liquid flow meter to the mixing valve (refer to the hook-up diagrams of the flow meter and the CEM to connect the required signals)



- Check the fluidic system for leaks before applying full process pressure, especially if toxic, explosive or other dangerous fluids are used
- Do not apply pressure until all required electrical connections are made

### 2.4.3 Working under vacuum

Depending on the used media and ambient conditions (temperature and pressure), draining and purging under vacuum can shorten the time that is needed to have all components of the fluidic system clean and dry.

For draining and purging under vacuum, extending the fluidic system with some additional tubing and valves is strongly recommended. This will facilitate easy and flexible deployment of the vacuum process, without sacrificing the accuracy and reliability of the instrumentation of the CEM system.



- To prevent leakage from the main fluidic path and the process to the vacuum lines, the vacuum lines should be separated from the main line with leak proof shut-off valves
- Additional components needed to enable vacuumising of the system may also require additional steps to be taken when performing operational procedures ([bleeding](#), [purging](#), [starting vapour production](#), [stopping vapour production](#))
- If necessary, contact your Bronkhorst representative for more information and assistance

## 2.5 Fluid supply

The recommendations in this section will help reduce risks of clogging and improve vapour flow stability.

### 2.5.1 Carrier gas



The carrier gas must be clean and dry. Impurities or particles in the gas can cause unwanted chemical reactions with the liquid and/or clogging of the fluidic system.

- If the presence of particles in your process media cannot be ruled out, installing a particle filter in the carrier gas supply line (upstream from the flow controller) is strongly recommended.
- If necessary, install a de-humidifier in the carrier gas supply line (upstream from eventual filters). Humidity in the carrier gas can cause chemical reactions in the mixing valve in combination with certain liquids.
- Purging the fluidic system before each use will reduce the presence of contaminants and remove moisture from the gas lines. See [Purging](#) for instructions.

### 2.5.2 Liquid purity

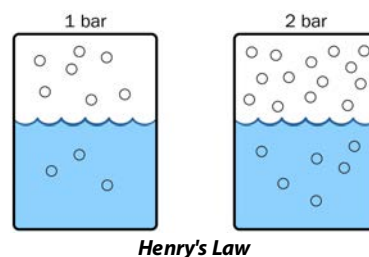
- If the presence of particles in your process media cannot be ruled out, installing a particle filter in the liquid supply line (upstream from the flow controller) is strongly recommended.
- Select a suitable filter size, to minimize the pressure drop, to prevent a degassing effect and instability of the liquid supply.
- For hydrophobic liquids use a hydrophobic filter.



Note that a filter will not stop dissolved matter like minerals and chemical stabilizers.

### 2.5.3 Minimizing gas dissolution

Typically, the CEM will be supplied with liquid from a pressurized container. However, pressurizing a liquid with a gas makes a portion of the gas dissolve in the liquid. The higher the gas pressure, the more gas will be dissolved in the liquid (Henry's Law: the solubility of a gas in a liquid is directly proportional to the partial pressure of the gas above the liquid). When the temperature rises or the pressure drops further down the line, the gas will come out of solution and form bubbles in the liquid, which makes it unstable.



Henry's Law



Gas entrapment by dissolution can be minimized by taking one of the following measures:

- Use a container or vessel with a membrane to pressurize the liquid; the membrane separates the gas from the liquid, so it cannot dissolve.
- Use a pump to feed the liquid. Note, however, that some pumps have a large internal volume, which lengthens the start-up time of the system. Also, some pump types (e.g. gear pumps) can cause cavitation, which introduces gas bubbles, exactly what was to be prevented.

If direct pressurization of the liquid with a gas is inevitable, these measures can keep gas dissolution to a minimum:

- Use a gas with a low solubility to pressurize the liquid (for instance Helium)
- Keep the gas pressure on the liquid as low as possible
- Relieve the gas pressure from the liquid when the CEM system is not in use

## 2.5.4 Liquid vessel size

The liquid vessel should be large enough to provide a stable flow for a sufficient amount of time between refills. Purging or flushing the fluidic system can consume a relatively large amount of liquid; take this into account when selecting a suitable vessel size. The table below gives an indication of the liquid consumption, based on different flow rates:

Flow rate		Liquid consumption	
g/h	mg/min	g per work week (40 hours)	g per week (24x7 hours)
0.1	1.6	4	16.8
1	16	40	169
10	160	400	1680
100	1600	4000	16800

## 2.6 Media compatibility

The wetted parts of the CEM are made of SS316 (heater) and SS304 (mixing valve). The standard sealing material for the mixing valve is Kalrez®, which is compatible with a wide range of chemicals.



Before deploying the CEM with any other media than specified at ordering time, be sure that the media are compatible with the wetted materials and sealing material. Accumulation of corrosion matter on the tubing interior can easily destabilize the flow, especially with (extremely) low flows.

### 3 Operation



*In systems for use with corrosive, reactive or explosive media, purging the fluidic system for at least 30 minutes with a dry, inert gas (like Nitrogen or Argon) is absolutely necessary before use. After use with such media, complete purging is also required before exposing the system to air.*

See section [Purging](#) for general purging instructions.

After correct installation and taking all necessary safety precautions, the CEM is ready to be used.

#### 3.1 Powering up



- It is recommended to turn on power before applying pressure and to switch off power after removing pressure
- Follow the guidelines in the manuals for the flow meters/controllers with regard to warming up



*When applying pressure, avoid pressure shocks and bring the fluidic system gradually up to the level of operating conditions; open and close the fluid supply gently.*

#### 3.2 Required setpoints

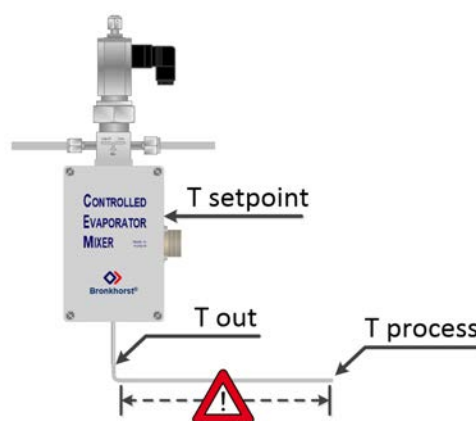


*The required setpoints for the carrier gas and liquid flows and the temperature of the heat exchanger can be obtained from FLUIDAT® on the Net, using the flow rates of the ordered instruments.*

*FLUIDAT® on the Net can be accessed via <http://www.fluidat.com>. Free registration on the FLUIDAT® website gives access to all available fluids and functionality.*

Basically, the temperature setpoint that FLUIDAT® calculates for the CEM ensures that the heater will evaporate the liquid and that the vapour temperature at the outlet will still be high enough to prevent condensation. As a result, the required temperature setpoint will almost always be higher than the required vapour temperature.

Further down the line, however, tubing length, process and ambient conditions can cause the vapour temperature to drop to a point where condensation might occur. See section [Assembly tips](#) how to prevent this.



### 3.3 Starting vapour production



- To prevent liquid from flowing into the gas flow controller, make sure that the liquid pressure is never higher than the gas pressure
- Always make sure to have a gas flow, before feeding the CEM with liquid. Follow the instructions in the exact order as mentioned below:

1. Set the setpoints of both flow controllers to 0%
2. Enter the required temperature setpoint for the heat exchanger
3. Pressurize the liquid and gas supply lines to the required values
4. [Bleed the mixing valve](#)
5. Change the gas flow setpoint to the required value (this may be done while the heat exchanger is warming up)
6. Wait until
  - a. the carrier gas flow has stabilized and
  - b. the temperature of the heat exchanger has reached its setpoint
7. Start adding liquid to the carrier gas flow, by gradually increasing the liquid flow setpoint to the required value

### 3.4 Stopping vapour production



- Do not switch off the heat exchanger before stopping the liquid flow; a too low temperature in the heat exchanger can prevent the liquid from vaporizing, which might choke its fluidic line.
- To stop the vapour flow, follow the instructions below:

1. Change the liquid flow setpoint to 0%
2. Change the CEM temperature setpoint to 0 °C
3. Change the carrier gas flow setpoint to 0%

### 3.5 Bleeding mixing valve



- In order to ensure stable and reliable control behaviour, the liquid tubing and dead space of the mixing valve should be kept free of gas, by bleeding the mixing valve from time to time
- Bleeding is recommended at the following occasions:
  - prior to first use of the CEM system
  - when restarting the system after purging
  - periodically, to remove accumulated gas (if any) from the liquid tubing and mixing valve
- If possible, prevent accumulation of gas bubbles in the liquid tubing during operation (see [Minimizing gas dissolution](#))
- Install a shut-off valve as close to the bleed connection as possible and connect a clear transparent tube to the valve outlet; being able to see gas bubbles in the liquid will ease monitoring the progress of the bleeding procedure



- Make sure to connect the bleed connection to an appropriate draining facility, especially if the system is used to vaporize dangerous liquids.
- Take appropriate safety measures, as described in the Material Safety Data Sheet(s) of the media to be processed (if applicable).

To bleed the mixing valve, follow this procedure:

1. Change the liquid flow setpoint to 0% (this closes the mixing valve)
2. Pressurize the liquid inlet
3. Open the bleed connection (slowly) until liquid starts to escape
4. Optionally, tap the valve assembly and/or liquid inlet of the mixing valve to let gas bubbles accumulate and migrate to the mixing valve
5. Close the bleed connection as soon as all gas has escaped through the mixing valve



## 3.6 Purging

Purging the fluidic lines of the CEM system is sometimes necessary, to prevent clogging of the tubing and instrumentation or (cross) contamination of process media. Purging the entire fluidic system is advised at the following occasions:

- before changing fluid types
- before and after using corrosive, reactive or explosive media
- before and after a shutdown period of more than one week
- every 3 months



Always use a dry, inert gas (like Nitrogen or Argon) to purge the fluidic system.



The purge times mentioned in the instructions below are rough indications; depending on the media properties (density, viscosity, volatility, etc.), longer or shorter times might be recommendable.

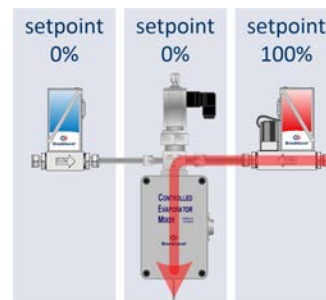
### Step 1: Preparation

- Set all setpoints to 0% (liquid flow, carrier gas flow, CEM temperature)
- Connect a purging gas supply facility to the inlets of **both flow controllers** (liquid and gas)
- Pressurise the purging gas supply line



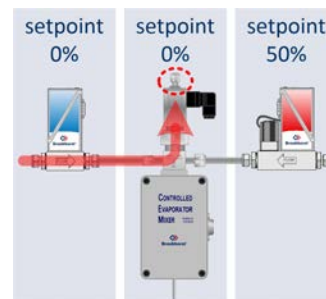
### Step 2: Gas tubing

- Change the carrier gas flow setpoint to 100%
- Purge for at least 30 minutes



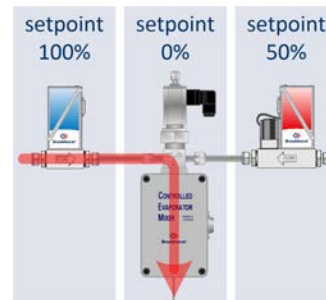
### Step 3: Mixing valve

- Change the carrier gas flow setpoint to 50% (this will help prevent liquid from flowing into the gas tubing and flow controller)
- Open the bleed connection on top of the mixing valve
- Purge for 10 to 15 minutes
- Close the bleed connection



### Step 4: Liquid tubing

- Change the liquid flow setpoint to 100%
- Purge for at least 30 minutes



### Step 5: Finishing

- Set the carrier gas flow setpoint to 0%
- De-pressurise the purging gas supply line
- Set the liquid flow setpoint to 0%

### 3.7 Digital parameters

Using an E-8000 CEM control module, the heating element of the CEM can be operated digitally via RS232 or fieldbus. This section describes the parameters that are used to monitor and control the heating element.



Consult the [E-8000 manual](#) for installation information and a description of the user interface.

#### Measure

Type	Access	Range	FlowDDE	FLOW-BUS	Modbus
Unsigned int	R	0...32000	8	1/0	0x0020/33

This parameter indicates the temperature measured by the CEM. The value range corresponds to 0...200 °C (the supported temperature range of the CEM control module).

#### Setpoint

Type	Access	Range	FlowDDE	FLOW-BUS	Modbus
Unsigned int	RW	0...32000	9	1/1	0x0021/34

This parameter sets the required temperature of the heater. Like *Measure*, its value range corresponds to 0...200 °C. Note that the heater has no cooling functionality; a setpoint evaluating to a lower temperature than the actual heater temperature effectively switches the heater off.

#### Fmeasure

Type	Access	Range	FlowDDE	FLOW-BUS	Modbus
Float	R	0...200	205	33/0	0xA100...0xA101/ 41217...41218

*Fmeasure* returns the measured temperature in °C.

#### Fsetpoint

Type	Access	Range	FlowDDE	FLOW-BUS	Modbus
Float	RW	0...200	206	33/3	0xA119...0xA11A/ 41241...41242

*Fsetpoint* sets the required temperature of the heater in °C. Note that the heater has no cooling functionality; a setpoint lower than the actual heater temperature effectively switches the heater off.

#### Capacity

Type	Access	Range	FlowDDE	FLOW-BUS	Modbus
Float	R	200	21	1/13	0x8168...0x8169/33129...33130

This parameter returns the maximum readout and control value (100%), expressed in units corresponding to parameter *Capacity Unit*. For the CEM control module, this parameter is fixed to 200 (°C); it might come in handy when scaling the value of parameter *Measure* (1 °C = 32000/200).

#### Capacity Unit

Type	Access	Range	FlowDDE	FLOW-BUS	Modbus
Unsigned char[7]	R	n/a	129	1/31	0x81F8...0x81FB/33273...33276

This parameter returns the capacity unit in which *Fmeasure* and *Fsetpoint* are expressed. For the CEM control module, this parameter is fixed to °C.

## 4 Maintenance

No regular maintenance is required if the CEM is operated properly, with clean media, compatible with the wetted materials, avoiding pressure and thermal shocks and vibrations. Units may be purged with a clean, dry and inert gas.

In case of severe contamination, cleaning the inside of the device may be necessary, by flushing the conduits with an appropriate cleaning fluid.



*Inexpertly servicing instruments can lead to serious personal injury and/or damage to the instrument or the system it is used in. Therefore, servicing must be performed by trained and qualified personnel. Contact your local Bronkhorst representative for information about cleaning and calibration. Bronkhorst has a trained staff available.*

## 5 Troubleshooting and service

For a correct analysis of the proper operation of an instrument, it is recommended to disconnect the unit from the process line and check it without applying fluid supply pressure. In case the unit is dirty or clogged, this can be ascertained immediately by loosening the fittings and performing a visual inspection.

Energizing and de-energizing the instrument can indicate if there is an electronic failure. After energizing, control behaviour can be checked by entering a temperature setpoint.



*If you suspect leakage, do not disassemble the instrument for inspection, but contact your local distributor for service or repairs.*

### 5.1 Common issues

Symptom	Possible cause	Action
Vapour too dry	Carrier gas flow too high	Decrease carrier gas flow
	Liquid flow too low	Increase liquid flow
Condensation at vapour outlet	CEM temperature setpoint too low	Increase CEM temperature setpoint
	Carrier gas flow too low	Increase carrier gas flow
	Liquid flow too high	Decrease liquid flow
CEM heater does not warm up	Fuse blown	Replace fuse
	Temperature sensor defective	Return equipment to factory
	Heater defective	Return equipment to factory
Vapour flow unstable	Pressure fluctuations on fluidic inlets	Eliminate pressure fluctuations, e.g. by installing a pressure regulator
	CEM temperature setpoint (much) too high	Decrease CEM temperature setpoint
	CEM power too high	Use a CEM with a lower power consumption
	Gas inclusion in tubing	<ul style="list-style-type: none"> <li>• Flush liquid lines with processing liquid at relatively high flow rate</li> <li>• Bleed mixing valve</li> </ul>
No communication between instruments and readout/control unit	No power supply	<ul style="list-style-type: none"> <li>• Check power supply</li> <li>• Check cable connection</li> <li>• Check cable hook-up</li> </ul>
	Sensor failure	Return equipment to factory

## 5.2 Service

For current information on Bronkhorst® and service addresses, please visit our website:



<http://www.bronkhorst.com>

Do you have any questions about our products? Our Sales Department will gladly assist you selecting the right product for your application. Contact sales by e-mail:



[sales@bronkhorst.com](mailto:sales@bronkhorst.com)

For after-sales questions, our Customer Service Department is available with help and guidance. To contact CSD by e-mail:



[support@bronkhorst.com](mailto:support@bronkhorst.com)

No matter the time zone, our experts within the Support Group are available to answer your request immediately or ensure appropriate further action. Our experts can be reached at:



**+31 859 02 18 66**

Bronkhorst High-Tech B.V.  
Nijverheidsstraat 1A  
NL-7261 AK Ruurlo  
The Netherlands

## 6 Returns

### 6.1 Removal and return instructions

When returning materials, always clearly describe the problem, and, if possible, the work to be done, in a covering letter.

#### Instrument handling:

1. Purge all fluidic lines (if applicable)
2. If toxic or dangerous fluids have been used, the instrument must be cleaned before shipping
3. Disconnect all external cabling and tubing and remove the instrument from the process line
4. If applicable, secure movable parts with appropriate transport safety materials, to prevent damage during transportation
5. The instrument must be at ambient temperature before packaging
6. Insert the instrument into a plastic bag and seal the bag
7. Place the bag in an appropriate shipping container; if possible, use the original packaging box

#### Add documentation:

- Reason of return
- Failure symptoms
- Contaminated condition
- Declaration on decontamination



**It is absolutely required to notify the factory if toxic or dangerous fluids have been in contact with the device!**  
This is to enable the factory to take sufficient precautionary measures to safeguard the staff in their repair department.

All instruments must be dispatched with a completely filled in 'Declaration on decontamination'. Instruments without this declaration will not be accepted.



A safety information document containing a 'Declaration on decontamination' form (document no 9.17.032) can be downloaded from the **Service & Support** section of the Bronkhorst website ([www.bronkhorst.com](http://www.bronkhorst.com)).

#### Important:

Clearly note, on top of the package, the customs clearance number of Bronkhorst High-Tech B.V.:

**NL801989978B01**

(only if applicable, otherwise contact your local Bronkhorst representative for local arrangements.)

### 6.2 Disposal (end of lifetime)

Within the scope of the European Union, manufacturers of electrical and electronic equipment (EEE) are bound to comply with the WEEE Directive (Waste Electrical and Electronic Equipment). As a consequence, Bronkhorst is obligated to offer its customers in the EU the possibility to return EEE for disposal once it has reached the end of its lifetime, and take all necessary steps to dismantle it properly and recycle or re-use its components whenever possible.

All Bronkhorst® products that fall under the regime of the WEEE Directive (which is the majority) have an image of a crossed-out wheeled bin printed somewhere on the product (typically the serial number label). If you wish to dispose of Bronkhorst® equipment bearing this symbol, you can simply return it in accordance with the [removal and return instructions](#), and Bronkhorst will take care of proper dismantlement and recycling. In the covering letter, just mention that you are returning the product for disposal. Within the EU, returning products for disposal is of course free of charge (except for shipping and handling costs).



For customers outside the EU, local or national directives and/or legislation may apply to EEE disposal. If applicable, consult local or national authorities to learn how to handle EEE properly in your area.