



Instruction Manual



E-8000 **Power Supply /** **Readout and Control System**

Doc. no.: 9.17.076 rev. M Date: 26-11-2024



ATTENTION

**Please read this document carefully before installing and operating the product.
Not following the guidelines could result in personal injury and/or damage to the equipment.
Keep this document for future reference.**



Copyright

© 2024 Bronkhorst High-Tech B.V. - All rights reserved.

Bronkhorst® is a registered trademark of Bronkhorst High-Tech B.V.
All trademarks are the property of their respective owners.

Disclaimer

The illustrations in this document serve to provide general notices regarding correct operation. Illustrations are simplified representations of the actual situation and may differ from the actual product.

Bronkhorst High-Tech B.V. reserves the right to modify or improve its products and documentation without notice. Prior to work, check whether a newer version of this document is available on the Bronkhorst website.

Symbols in this document



Important information. Disregarding this information could increase the risk of damage to the equipment, or the risk of personal injuries.



Tips, useful information, attention points. This will facilitate the use of the instrument and/or contribute to its optimal performance.



Additional information available in the referenced documentation, on the indicated website(s) or from your Bronkhorst representative.

Receipt of equipment

- Check that the outer packaging and its contents have not been damaged during transport. If the outer packaging or its contents are damaged, the local carrier must be informed immediately regarding his liability, if so required. At the same time a report should be submitted to your Bronkhorst representative.
- If the product is damaged, it should not be put into service. In that case, contact your Bronkhorst representative for service.
- Check the packing list to ensure that you received all items included in the scope of delivery.
- Do not discard spare or replacement parts.
- See [Removal and return instructions](#) for information about return shipment procedures.

Equipment storage

- The equipment should be stored in its original package in a climate controlled storage location.
- Care should be taken not to subject the equipment to excessive temperatures or humidity.
- See technical specifications (data sheet) for information about required storage conditions.

Warranty

For information about the warranty and the conditions of sales, please visit the Bronkhorst website:
www.bronkhorst.com/about/conditions-of-sales/

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 prevent 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.

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 attached to the product. These signs have the following meaning:



General warning; 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. Non-safety related components 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 suitability of a replacement component, contact your Bronkhorst representative for information.

Table of contents

1	Introduction	9
1.1	Scope of this manual	9
1.2	Declaration of conformity	9
1.3	Other documents	9
2	Starting up	10
2.1	Functional properties	10
2.2	Install system	10
2.3	Model key	10
2.4	Housing	11
2.4.1	Housing table top	11
2.4.2	Housing panel/rack mount	11
2.4.3	Housing table top with handle	11
2.4.4	Housing dimensions	12
2.5	Power supply	12
2.6	Power consumption	13
2.7	System setup and maximum internal power supply	13
2.8	EMC requirements	14
2.9	Display specifications	14
3	User interface	15
3.1	General operation	15
3.1.1	Buttons	15
3.1.2	Power-up	15
3.1.3	Display	15
3.1.4	Search instrument	16
3.1.5	Reset alarm	18
3.1.6	Reset counter	19
3.1.7	Edit setpoint	19
3.1.8	Top line	20
3.1.9	Custom readout 1	20
3.1.10	Custom readout 2	21
3.1.11	Measure readout	21
3.2	Settings menu	21
3.2.1	Readout settings screen	22
3.2.2	Readout format	22
3.2.3	Fluid set selection	23
3.2.4	Fluid capacity	23
3.2.5	Controller settings screen	24
3.2.6	Controller speed	24
3.2.7	Setpoint slope	25
3.2.8	Controller mode	25
3.2.9	Controller response settings	26
3.2.10	PID controller settings	27
3.2.11	Master slave settings	28
3.2.12	Counter settings screen	28
3.2.13	Set setpoint at counter limit	29
3.2.14	Set counter parameters	30

3.2.15	Set counter mode	31
3.2.16	Alarm settings screen	31
3.2.17	Set alarm mode	32
3.2.18	Set alarm mode parameters	32
3.2.19	Set setpoint at alarm	33
3.2.20	Setup menu	34
3.2.21	Get instrument information	34
3.2.22	Change user tag	35
3.2.23	Customize display info	35
3.2.24	Display appearance	35
3.3	Communication settings	36
3.3.1	Operator	36
3.3.2	Instrument	37
3.4	Advanced settings	39
3.4.1	Advanced menu	39
3.4.2	Sensor filter settings	39
3.4.3	Restore instrument settings	39
3.4.4	Sensor auto zero	40
3.5	Security settings	41
3.5.1	Security modes	41
3.5.2	Enter the security settings screen	41
3.5.3	Security items	41
3.5.4	Change password	42
3.5.5	Reset password	42
4	Modules	43
4.1	Power supply	43
4.1.1	Model key power supply	43
4.1.2	Electrical connection	43
4.1.3	Bus powering	43
4.2	Readout and control	44
4.2.1	Model key readout and control	44
4.2.2	Instrument terminal	44
4.2.3	FLOW-BUS terminal	45
4.3	CEM controller	45
4.3.1	Model key CEM controller	46
4.3.2	Fieldbus options for CEM controller	47
4.3.3	Electrical connection for CEM controller	47
4.3.4	Rear panel connection for CEM controller	48
4.3.5	Electrical properties for CEM controller	49
4.3.6	Instrument I/O connection for CEM controller	49
4.3.7	Operation of CEM controller module	50
4.4	Ex-Proof modules	51
4.4.1	Model key Ex-Proof modules	51
4.4.2	Intrinsic safe electronic units	52
4.4.2.1	Transmitter supply unit for flow sensors	52
4.4.2.2	Isolating repeater for XB coil	52
4.4.3	Rear panel connections for Ex-Proof module	52
4.4.3.1	Instrument I/O	53
4.4.3.2	Sensor connection	53

4.4.3.3	Valve connection XB	53
4.4.3.4	Valve connection XC	54
4.4.4	Fieldbus options for Ex-Proof module	54
4.4.5	Electrical connection for Ex-Proof module	54
4.4.6	Electrical properties for Ex-Proof module	55
4.4.7	Cables	55
4.4.7.1	General	55
4.4.7.2	Cable for sensor	55
4.4.7.3	Cable for valve XB/XC	55
4.4.8	EMC and intrinsic safe circuits	55
4.4.9	Operation of Ex-Proof controller module	55
4.5	PID controller	56
4.5.1	Model key PID controller	56
4.5.2	Rear panel connections for PID controller	57
4.5.2.1	Instrument I/O connection for PID controller	57
4.5.2.2	Actuator connection for PID controller	58
4.5.2.3	Sensor connection for PID controller	58
4.5.3	Fieldbus options for PID controller	59
4.5.4	Electrical connection for PID controller	59
4.5.5	How to connect an instrument	60
4.5.6	Electrical properties for PID controller	61
4.5.7	Operation of PID controller module	61
5	Troubleshooting	62
6	Removal and return instructions	63
6.1	Returns	63
6.2	Disposal (end of lifetime)	63
7	Service	64

1 Introduction

1.1 Scope of this manual



The Bronkhorst® series E-8000 is a modular Power Supply/Readout and Control (R/C) system for digital mass flow / pressure meters and controllers. Every model can be fitted with or without displays.



Because the E-8000 uses the RS232 port of these instruments for communication, other RS232 communication is not possible. Fieldbus communication with the instrument will not be affected. Measure, setpoint and other parameters can be read and written by the E-8000 or via the fieldbus system.

1.2 Declaration of conformity



The CE mark on the product indicates that it complies with requirements imposed by the European Union.



Declarations of Conformity applicable to standard Bronkhorst® products can be downloaded from www.bronkhorst.com/downloads

1.3 Other documents

Hook-up diagrams

E-8000 Readout

- E-8000 Readout - Supply (doc. nr. 9.16.112)
- E-8000 Readout - RS232 + Supply (doc. nr. 9.16.113)
- E-8000 Readout - FLOW-BUS + Supply (doc. nr. 9.16.114)

E-8000 CEM controller

- E-8000 CEM Controller - Analog I/O (doc. nr. 9.16.102)
- E-8000 CEM Controller - RS232 (doc. nr. 9.16.103)
- E-8000 CEM Controller - FLOW-BUS (doc. nr. 9.16.104)
- E-8000 CEM Controller - PROFIBUS DP (doc. nr. 9.16.105)
- E-8000 CEM Controller - DeviceNet™ (doc. nr. 9.16.106)
- E-8000 CEM Controller - Modbus (doc. nr. 9.16.107)
- E-8000 CEM Controller - EtherCAT® (doc. nr. 9.16.108)
- E-8000 CEM Controller - PROFINET (doc. nr. 9.16.150)
- E-8000 CEM W-10xA/202A (doc. nr. 9.16.109)
- E-8000 CEM W-303B 230Vac (doc. nr. 9.16.115)
- E-8000 CEM W-303B 120Vac (doc. nr. 9.16.116)

E-8000 Ex-Proof (ATEX)

- E-8000 ATEX - Analog I/O (doc. nr. 9.16.138)
- E-8000 ATEX - RS232 (doc. nr. 9.16.139)
- E-8000 ATEX - FLOW-BUS (doc. nr. 9.16.140)
- E-8000 ATEX - PROFIBUS (doc. nr. 9.16.141)
- E-8000 ATEX - DeviceNet™ (doc. nr. 9.16.142)
- E-8000 ATEX - Modbus (doc. nr. 9.16.143)
- E-8000 ATEX - EtherCAT® (doc. nr. 9.16.144)
- E-8000 ATEX - PROFINET (doc. nr. 9.16.145)
- E-8000 ATEX MFM (doc. nr. 9.16.153)
- E-8000 ATEX MFM/XB (doc. nr. 9.16.154)
- E-8000 ATEX MFM/XC (doc. nr. 9.16.155)

E-8000 PID

- E-8000 PID Analog I/O (doc. nr. 9.16.157)
- E-8000 PID RS232 (doc. nr. 9.16.158)
- E-8000 PID FLOW-BUS (doc. nr. 9.16.159)
- E-8000 PID PROFIBUS (doc. nr. 9.16.160)
- E-8000 PID DeviceNet (doc. nr. 9.16.161)
- E-8000 PID Modbus (doc. nr. 9.16.162)
- E-8000 PID EtherCat (doc. nr. 9.16.163)
- E-8000 PID PROFINET (doc. nr. 9.16.164)



These documents can be downloaded from www.bronkhorst.com/downloads or can be sent by e-mail on request.

2 Starting up

2.1 Functional properties

Before installing the E-8000 system, check the label on the rear side of the instrument to see if the properties match your requirements:

- Instrument type
- Power supply
- Power
- Fuse type
- Tmax
- Signals



2.2 Install system



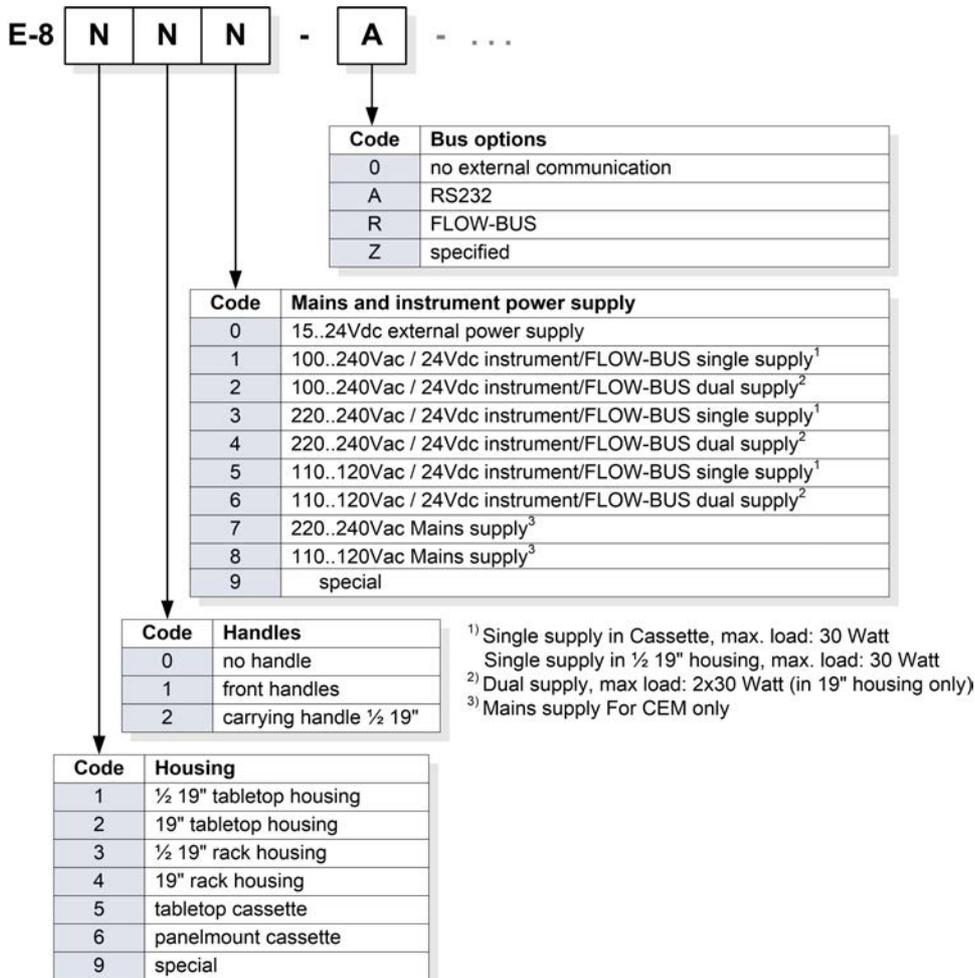
Before switching on power, please check if all external electrical connections with sensor/controllers and FLOW-BUS (if necessary) are properly connected.



If you receive a readout unit including meters/controllers, the total system has been tested in full operation under the nearest process-conditions.

2.3 Model key

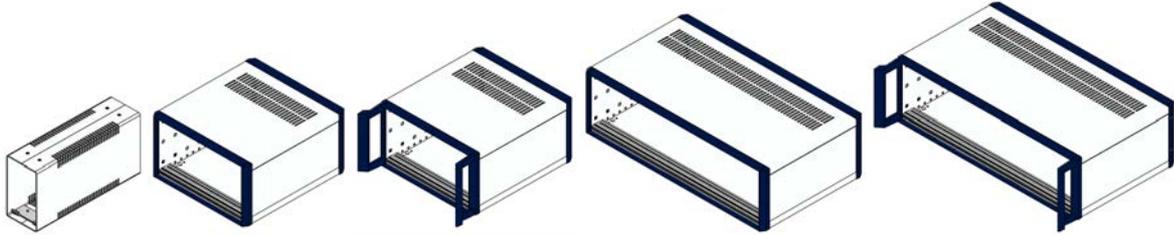
The model key on the serial number label contains information about the technical properties of the instrument as ordered. The actual properties of your unit can be retrieved with the diagram below. See also chapter [Modules](#) for model keys of the incorporated modules.



2.4 Housing

The E-8000 comes in 3 different housing types, divided in table top and rack mount versions. This section provides an overview of the different models, each of them IP20 protected.

2.4.1 Housing table top



Cassette

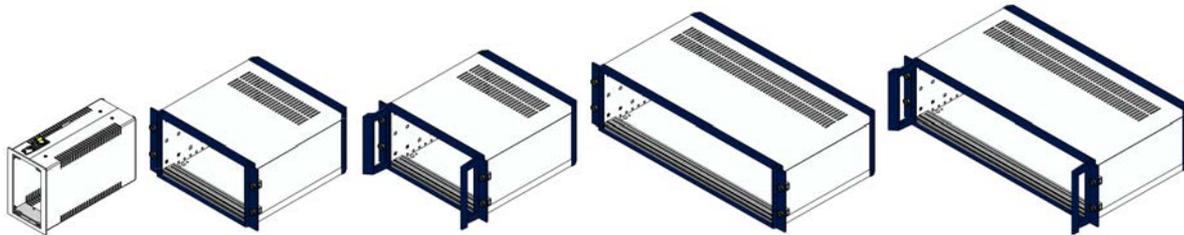
½19"

½19" with front handles

19"

19" with front handles

2.4.2 Housing panel/rack mount



Cassette

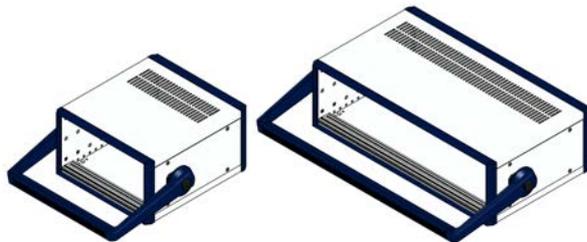
½19"

½19" with front handles

19"

19" with front handles

2.4.3 Housing table top with handle

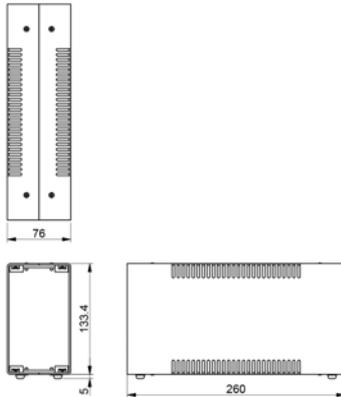


½19" with carrying handle

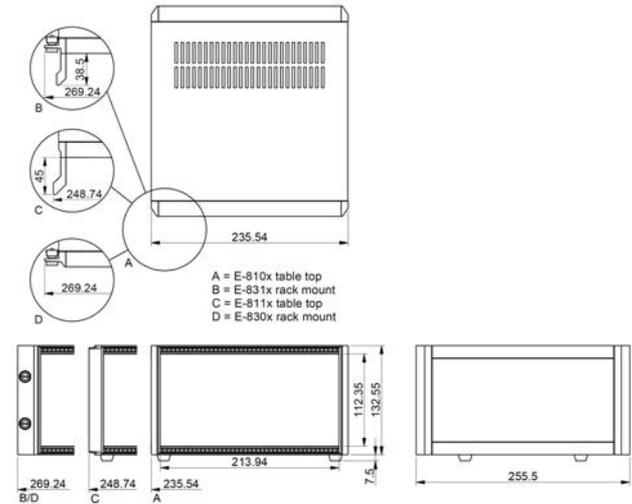
19" with carrying handle

2.4.4 Housing dimensions

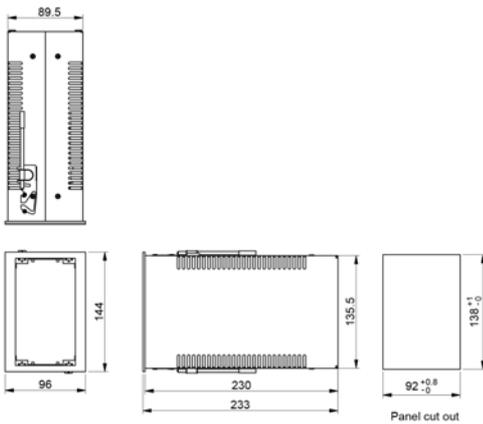
14TE Cassette table top housing



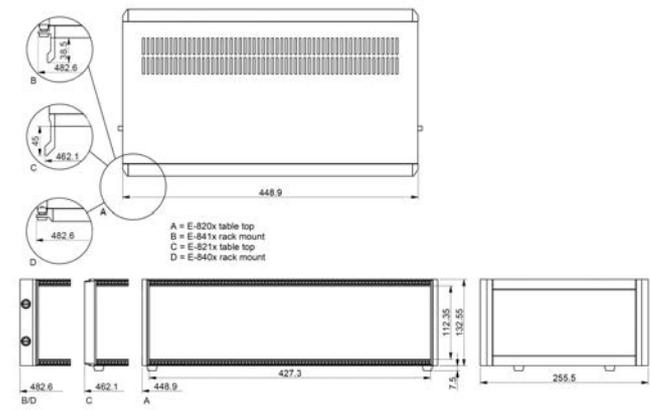
½ 19" housing



14TE Cassette table rack mount housing



19" housing



2.5 Power supply

Each E-8000 series housing incorporates one or two power supplies. System setup is such that the instruments that belong to the system can be powered. For other applications or modifications your supplier should be consulted. The power input incorporates an on/off switch and a fuse.



Bronkhorst recommends using their standard cables. These cables have the right connectors and if loose ends are used, these will be marked to prevent wrong connection. The hook-up diagrams are available at the download section of our website: www.bronkhorst.com/downloads



The instruments contain electronic components that are susceptible to damage by electrostatic discharge. Proper handling procedures must be taken during installation, removing and connecting the electronics.



Please note that E-8000 instruments are rated IP20, implying that the electronics housings and electrical connections do not offer any protection against moist environments.

2.8 EMC requirements

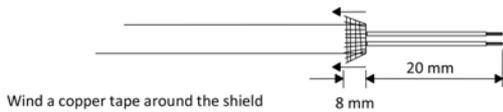
All system setups described in this manual carry the CE-mark. Therefore they have to comply with the EMC requirements as are valid for this kind of equipment.



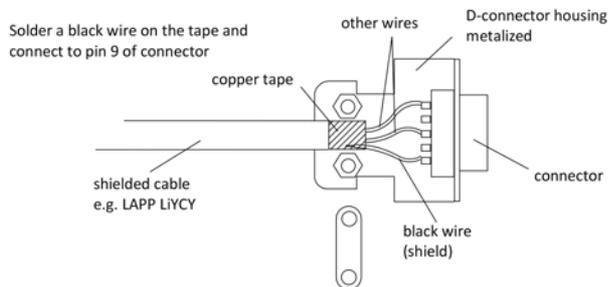
However compliance with the EMC requirements is not possible without the use of proper cables and connector assemblies.

For good results Bronkhorst can provide standard cables. Otherwise follow the guidelines as stated below. For cables with 9-pin D-sub connectors:

Fold the shield of the cable back over the cable (the shield must be around the cable)



Wind a copper tape around the shield



Solder a black wire on the tape and connect to pin 9 of connector



For FLOW-BUS SFTP data (patch)cable connection to RJ45 connectors follow the instructions of the supplier. It is important to use shielded twisted pair cables and shielded RJ45 modular jack connectors.

2.9 Display specifications

- ✓ 1.8" color TFT display with a 128x160 pixel resolution
- ✓ 100 MHz Processor
- ✓ 15...24Vdc 0.6W Power Consumption
- ✓ RS232 38k4 communication
- ✓ Operating temperature 0...40°C

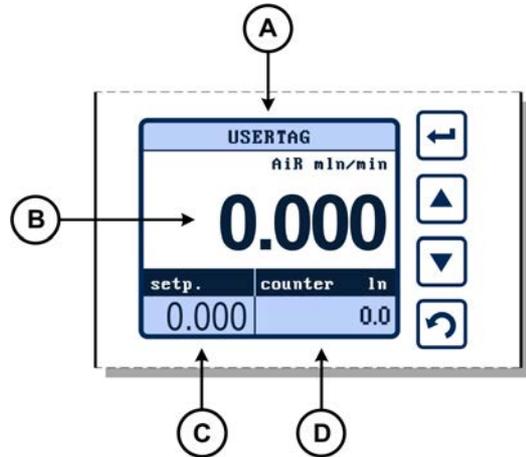
3 User interface

3.1 General operation

3.1.1 Buttons

The buttons have the following functions:

-  - Enter selected menu
- Enter edit mode
- Confirm selection/changes
-  - Menu selection up
- Select information field
- Next character in edit mode
- Up in table
-  - Menu selection down
- Select information field
- Previous character in edit mode
- Down in table
-  - Return to previous screen
- Undo, cancel and exit edit mode
- Switch content in the 'Custom readout 2' field

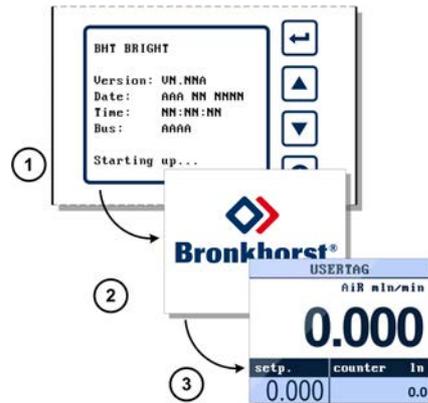


- (A)** Top line
- (B)** Measure readout
- (C)** Custom readout 1
- (D)** Custom readout 2

3.1.2 Power-up

When powering up, the E-8000 shows consecutively:

- 1 Firmware: version, date and time
Active bus type: FLOW-BUS or Local RS232
- 2 Bronkhorst® logo
- 3 Readout screen

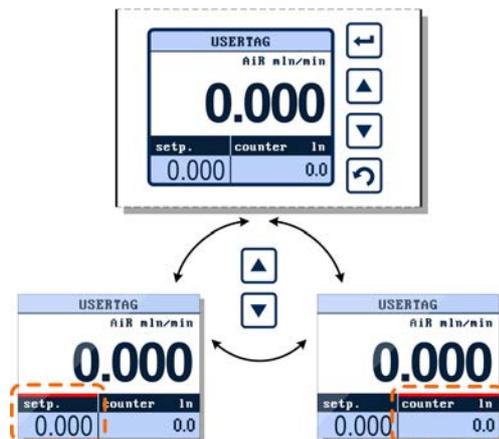


3.1.3 Display

The display is divided into 4 areas, 'Top line', 'Measure readout', 'Custom readout 1' and 'Custom readout 2'. The information in these areas can be configured by the user.

If an area contains a parameter which can be set or reset by the operator, you can press  or  to select this parameter. Press  to enter the edit mode or press  to return to the 'Measure readout' screen **(B)**.

 If 'Custom readout 1' is disabled, you can only switch between 'Measure readout' and 'Custom readout 2'.



3.1.4 Search instrument

When the E-8000 operator is connected to a FLOW-BUS system, it is possible to search another instrument on this bus to operate. Check section [3.1.10 - Custom readout 2](#) how to search the 'instrument' item.

To enter the 'instrument' mode, press the  button until the red line appears above 'Custom readout 2', then press  to activate this field.



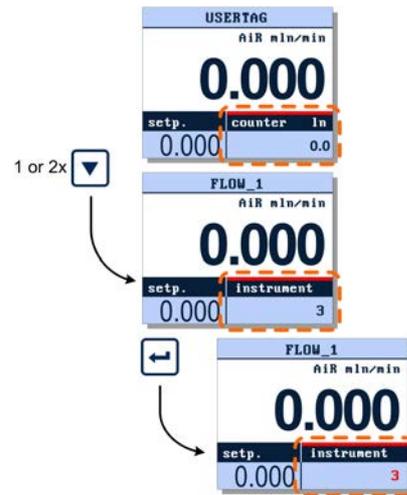
The number of displays that have the same instrument selected must not exceed 3.



Security settings can be set to avoid unauthorized access to this option.



For changing security settings see section [3.5 - Security settings](#).



When the instrument has **no** connection to the FLOW-BUS system and is showing in the area 'Measure readout' the text 'Please select an instrument', it is possible to search an instrument on this bus to operate.

To search an instrument, press  5x until the Customer readout 2 parameter 'instrument' appears. To enter the instrument mode, press the  button until the red line appears above 'Custom readout 2', then press  to activate this field.



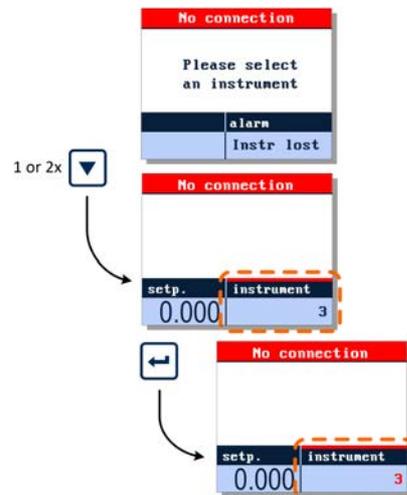
The number of displays that have the same instrument selected must not exceed 3.



Security settings can be set to avoid unauthorized access to this option.

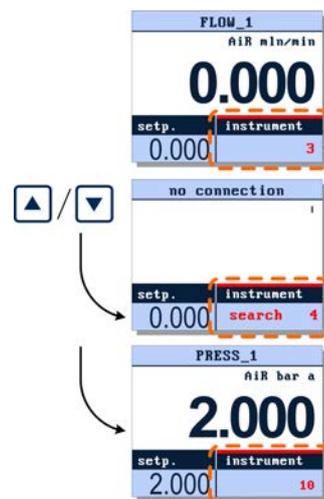


For changing security settings see section [3.5 - Security settings](#).

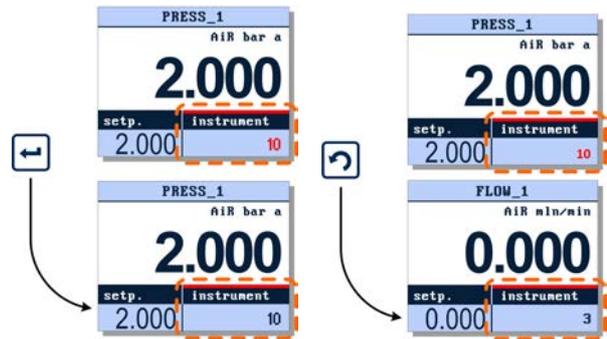


Instruments are indicated with their node address. Press  or  to search for an instrument on the bus. While the message 'search' is displayed, the E-8000 is searching for a valid node address and it will not show any specific instrument info until an active node is found.

When an active node address is found, the screen will show the corresponding serial number or USERTAG in the 'Top line'. It will also show the actual measure and, if applicable, the actual setpoint.



Press  to select this instrument to be operated by the E-8000 or press  to return to the previously selected instrument.



It is possible to change the operator node address manually by means of the operator, see section [3.3.1 - Operator](#). It is possible to change the instrument node address manually by means of the operator, see section [3.3.2 - Instrument](#).



For further instructions about the FLOW-BUS interface see manual 9.17.024 Manual 'FLOW-BUS interface for digital instruments'. This manual is available at the download section of our website: www.bronkhorst.com/downloads

3.1.5 Reset alarm

Alarm messages will be shown in the 'Top line' of the display and 'Custom readout 2' will be selected automatically.

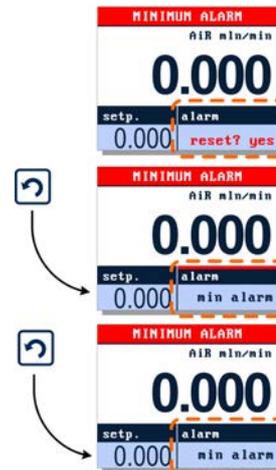
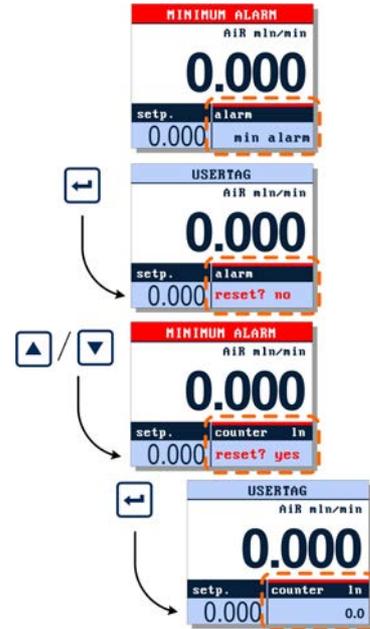
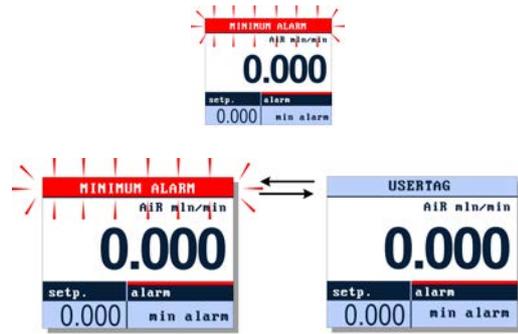
Enter the edit mode by pressing . Use  or  to select 'yes' and press  again to confirm.

 An alarm message will be occurring as long as the cause has not been removed/repaired.

 Security settings can be set to avoid unauthorized access to this option.

 For changing security settings see section [3.5 - Security settings](#).

The  button can be used to exit the edit mode and cancel the changes. If you are not intending to reset the alarm, you can press  to deactivate 'Custom readout 2'. Check section [3.1.10 - Custom readout 2](#) how to select another parameter in this readout. Actual alarm messages will always be shown in the 'Top line'.

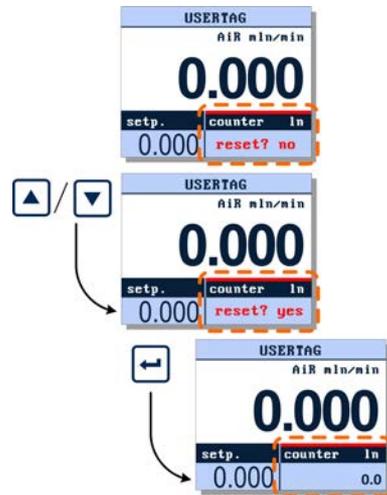
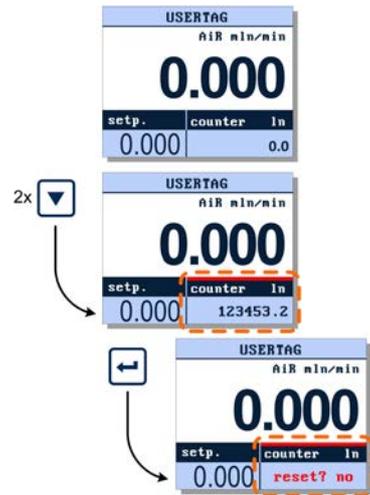


3.1.6 Reset counter

Check section [3.1.10 - Custom readout 2](#) how to change the shown parameter.

To reset the counter press 2x  in the selected readout area in which this parameter is displayed. Press  to enter the edit mode.

Press  or  to select 'yes' and press  to confirm. The counter will be reset to 0.
The  button can be used to exit the edit mode and cancel the changes.



3.1.7 Edit setpoint

Setpoint can only be edited when the setpoint parameter is displayed in 'Custom readout 1' or 'Custom readout 2'.

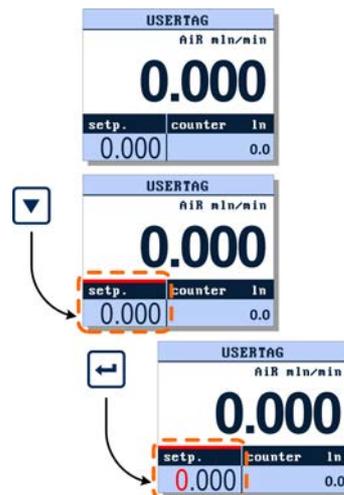
To edit the setpoint press  to select the readout area in which this parameter is displayed. Press  to enter the edit mode, the first digit will lighten.



Security settings can be set to avoid unauthorized access to this option.

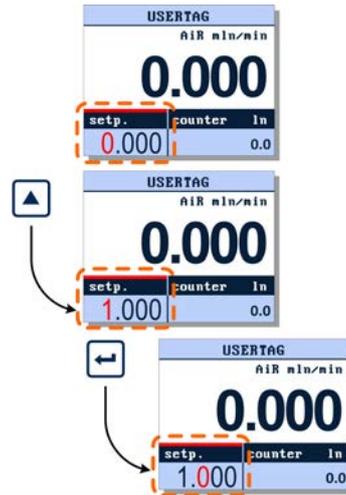


For changing security settings see section [3.5 - Security settings](#).



Use or to change the digits, press to confirm and select the next digit.

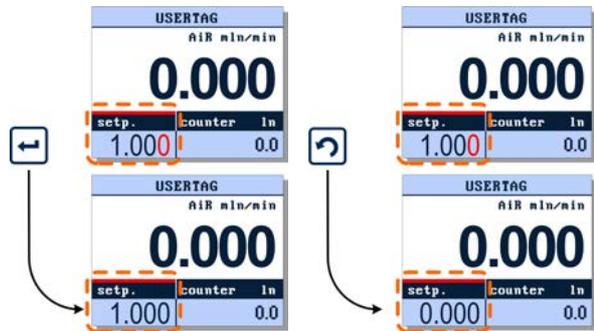
You can change the setpoint edit mode into 'step'. This enables you to change the setpoint using fixed steps. See section [3.2.23 - Customize display info](#).



After the last digit is confirmed by pressing , the setpoint will be sent to the instrument.

If the entered setpoint is ignored, check controller mode. See section [3.2.8 - Controller mode](#).

The button can be used to exit the edit mode and cancel the changes.



3.1.8 Top line

The 'Top line' will show the serial number or user tag of the connected instrument. Instructions about changing the user tag can be found in [3.2.22 - Change user tag](#).



3.1.9 Custom readout 1

The 'Custom readout 1' area can be enabled or disabled by the operator. When enabled, the operator can choose one of the following parameters to be shown:

parameter	editable
setpoint	yes
actuator	no
temperature	no
density	no

The available parameters of this area are determined by the connected instrument.

See section [3.2.23 - Customize display info](#) to select one of the above parameters.



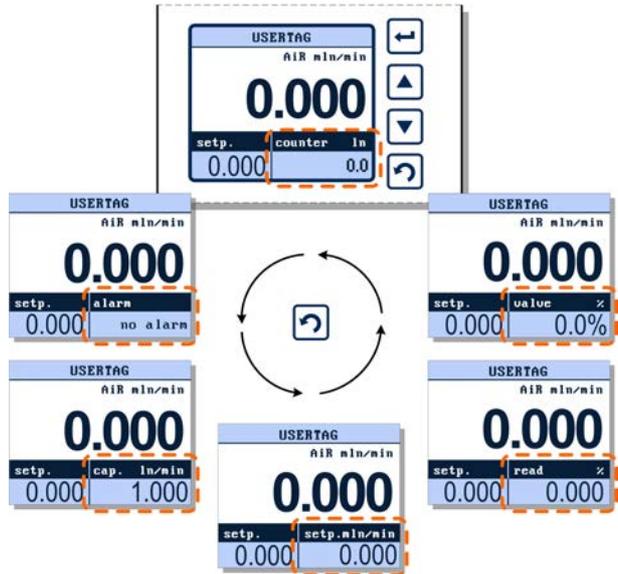
3.1.10 Custom readout 2

The 'Custom readout 2' area is always visible. The operator can choose one of following parameters to be shown:

parameter	editable
counter	yes
setpoint	yes
actual or percentage reading	no
actuator	no
alarm	yes
capacity	no
temperature	no
density	no
instrument	yes

i The available parameters of this area are determined by the connected instrument.

From the 'Measure readout' press  to change the readout parameter of 'Custom readout 2'. Press  again to select the next available parameter.



3.1.11 Measure readout

The 'Measure readout' area shows the actual measured value. The following parameters will affect the format of this readout:

- actual or percentage readout
- number of digits



3.2 Settings menu

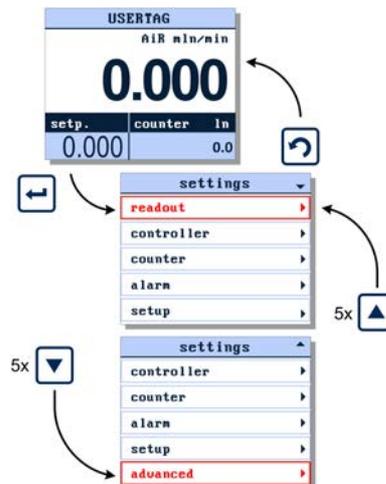
From the readout screen press  to enter the settings menu. Use the  button to return to the measure readout screen.

! Security settings can be set to avoid unauthorized access to this option.

i For changing security settings see section [3.5- Security settings](#).

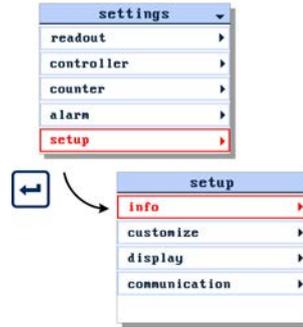
i The available menu options are determined by the instrument you are operating.

In the following explanation, all possible options are shown.



The ▼ or ▲ signs in the upper right corner indicates that not all the menu items fit in the display and that you need to scroll through the menu using the ▲ and ▼ buttons to view the hidden menu items. Press ◀ to enter the selected menu item.

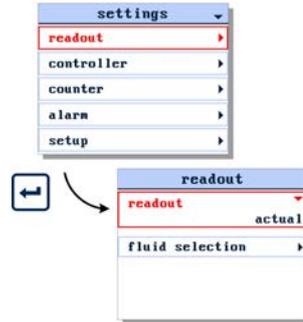
Use the ⏪ button to return to the measure readout screen.



3.2.1 Readout settings screen

In the readout settings screen you can edit the following settings:

menu item	description
readout	set readout format to actual or percentage
fluid selection	<ul style="list-style-type: none"> select fluid change capacity of the selected fluid

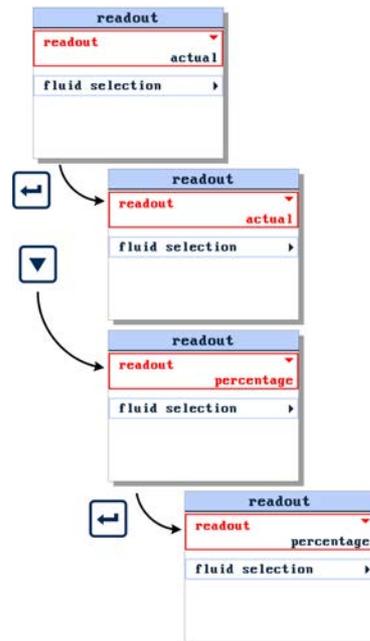


3.2.2 Readout format

Enter the readout settings screen and press ◀ to enter the edit mode of the *readout* option. Use ▲ or ▼ to select either 'actual' or 'percentage'.

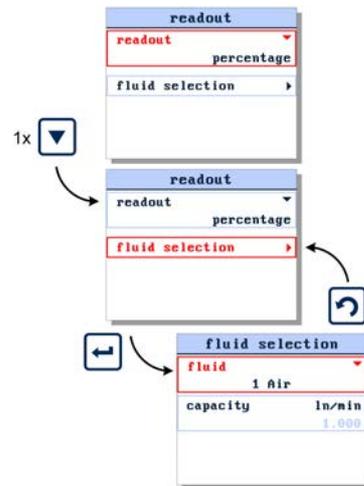
Press ⏪ to exit the edit mode without changing or press ◀ to confirm your selection.

Press ⏪ to return to the settings menu. Press ⏪ again to return from the settings menu to the readout screen.



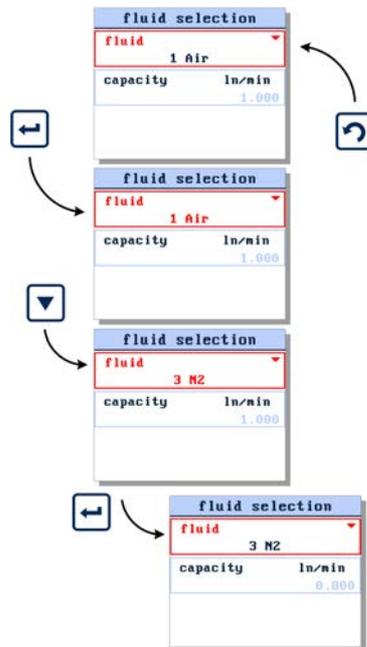
3.2.3 Fluid set selection

From the readout screen press \downarrow to select *fluid selection* and press \leftarrow to enter the fluid selection.



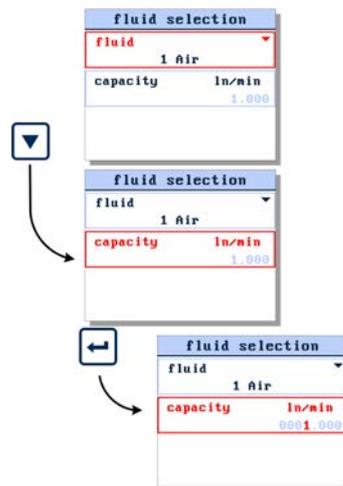
Press \leftarrow again to enter the edit mode of the *fluid* item. Use \uparrow or \downarrow to select one of the available fluid sets. Press \leftarrow to confirm.

Press 3x \rightarrow to return to the measure readout screen.



3.2.4 Fluid capacity

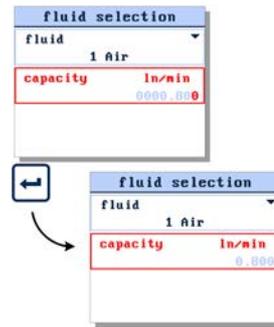
From the readout screen, press \downarrow to select *fluid selection* and press \leftarrow to enter. In the fluid selection screen press \downarrow to select capacity and press \leftarrow to enter the edit mode.



Now the fluid capacity can be changed between the minimal and maximal capacity of the selected fluid of the operating instrument.

When the last character is confirmed, the value will be activated. Pressing  before confirming the final character will undo changes.

Use the  button to return to the measure readout screen.



3.2.5 Controller settings screen

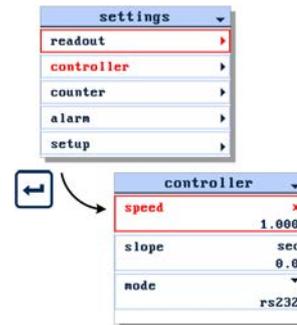
To enter the controller settings screen, select the *controller* option from the settings menu and press .

From the controller settings screen you can edit the following settings:

menu item	description
speed	set controller speed
slope	set setpoint slope time
mode	set controller mode
pid controller	set PID controller parameters



Be aware that changing the controller settings may cause unpredictable instrument behavior.



3.2.6 Controller speed

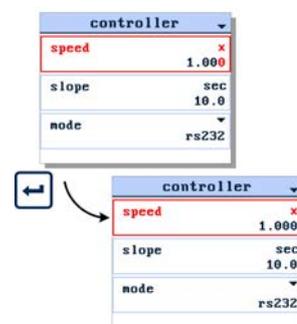
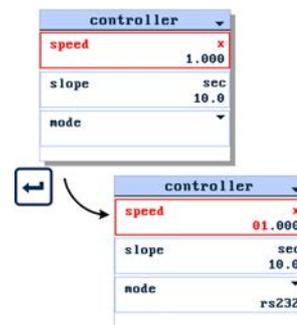
This parameter is the controller speed factor. The **pid-Kp** is multiplied by this factor.

When entering the controller speed settings screen, the controller *speed* parameter is already selected. Press  to enter the edit mode.

Now you can change the speed. Use  and  to select a character and press  to select the next character. Press  to exit the edit mode without changes.

Pressing  after changing the final character will confirm your input, the value will be sent to the instrument.

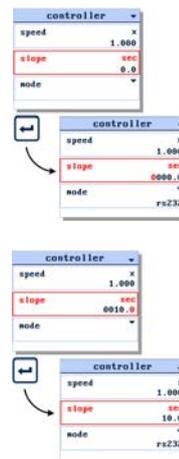
Use the  button to return to the measure readout screen.



3.2.7 Setpoint slope

When entering the controller settings screen, the setpoint *slope* parameter is already selected. Press **↵** to enter the edit mode.

Now you can change the slope time. Use **▲** and **▼** to select a character and press **↵** to select the next character. Press **⏪** to exit the edit mode without changes. Pressing **↵** after changing the final character will confirm your input, the value will be sent to the instrument. Use the **⏪** button to return to the measure readout screen.

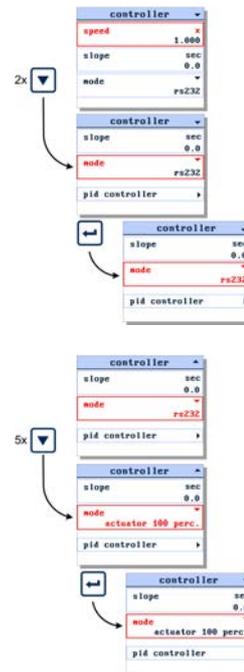


3.2.8 Controller mode

Enter the controller settings screen from the settings menu. Use **▼** to select the *controller mode* parameter and press **↵** to enter the edit mode. The following controller modes can be selected:

selection	description
analog input	Setpoint via analog input
bus/rs232	Setpoint via bus or RS232 (E-8000)
rs232	Setpoint via RS232 only (E-8000)
fb ana slave	Setpoint is factor of measure of master on the bus, factor is set by analog input.
analog slave	Setpoint is factor of analog input
fb slave	Setpoint is factor of measure of master on the bus
actuator steering	Controller is disabled, actuator output is directly linked to setpoint (50% setpoint output = 50% actuator output)
actuator 100 perc.	Controller is disabled, 100% actuation
actuator 0 perc.	Controller is disabled, 0% actuation
controller idle	Controller is disabled, actuator stays in actual position
setpoint 100 perc.	Setpoint is 100%
setpoint 0 perc.	Setpoint is 0%

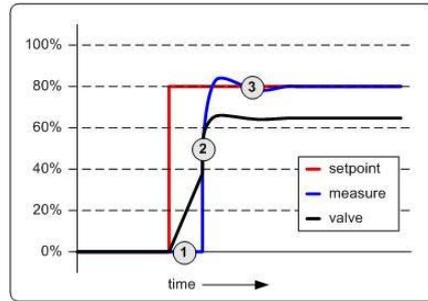
Use **▲** or **▼** to select one of these control modes. Press **⏪** to cancel selection and exit the edit mode without changes. When the required control mode is selected, press **↵** to confirm.



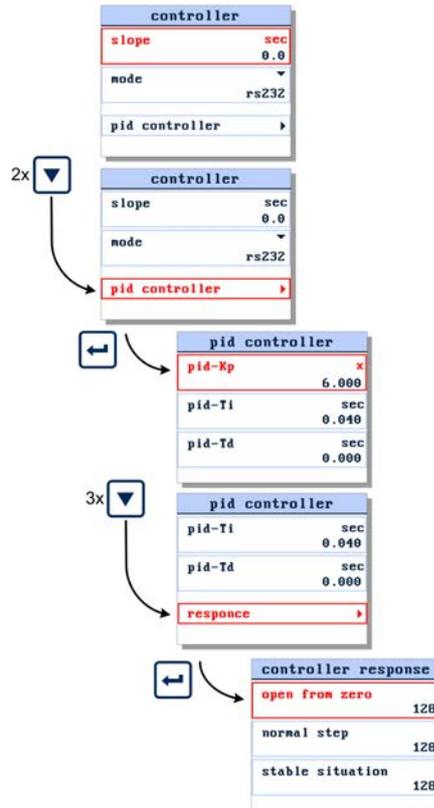
3.2.9 Controller response settings

The controller response settings can be used to fine tune the controller response. We have defined three control ranges. For each range we defined a parameter to influence the controller speed.

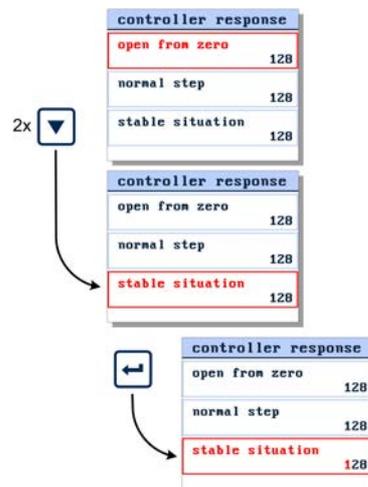
- ① Open from zero
- ② Normal step
- ③ Stable situation



To edit the controller response parameters, select the *pid controller* item and press \leftarrow . In the *pid controller* settings screen select the option *response* and press \leftarrow to enter.



In the *controller response* settings screen you can select one of the parameters using \uparrow and \downarrow . Press \leftarrow to enter the edit mode.



In the edit mode, use \uparrow and \downarrow to change each character. Press \leftarrow to select the next character.

Press \rightarrow to exit the edit mode without changes.

When the final character is changed, press \leftarrow to confirm and to exit the edit mode.

controller response	
open from zero	128
normal step	128
stable situation	100

\leftarrow

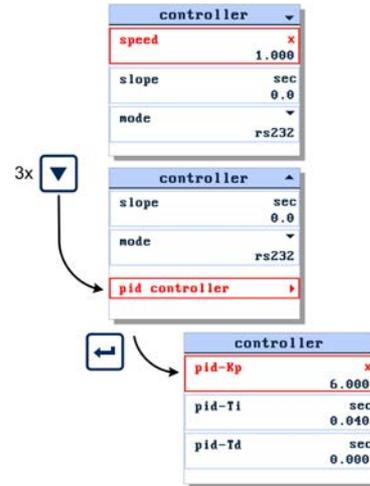
controller response	
open from zero	128
normal step	128
stable situation	100

3.2.10 PID controller settings

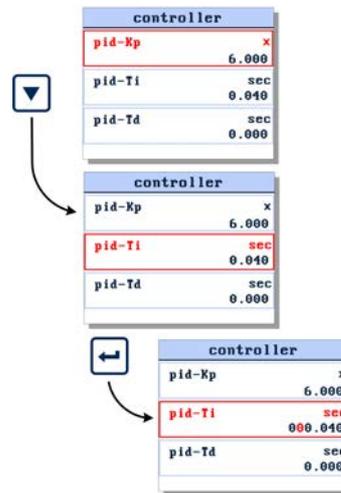
You can tune the controller settings by changing the PID parameters. To edit these parameters use the \downarrow button to select the *pid controller* option and press \leftarrow again.



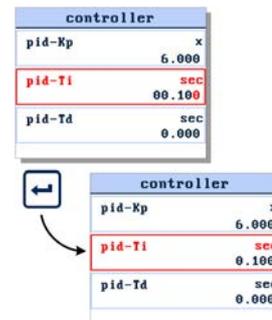
You can find more information about these controller settings in the manual: 9.17.023, This manual is available at the download section of our website: www.bronkhorst.com/downloads



In the *pid controller* settings screen you can select one of the PID parameters using \uparrow and \downarrow . Press \leftarrow to enter the edit mode.



Use the \uparrow and \downarrow buttons to edit each character, press \leftarrow to select the next character. Press \rightarrow to cancel the input and exit the edit mode without changes. By pressing \leftarrow after the final character you will confirm the value. The new value will be sent to the instrument.



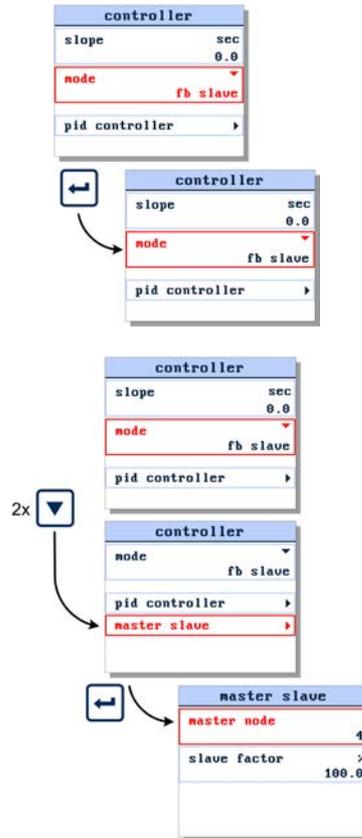
3.2.11 Master slave settings

When you select one of the three slave modes the *master slave* option will be added to the controller settings screen.

To enter the master slave settings screen, select the master slave option from the controller settings screen and press  to enter.

Depending of the selected mode the following parameters can be selected:

	fb ana slave	analog slave	fb slave
master node	o		o
slave factor		o	o



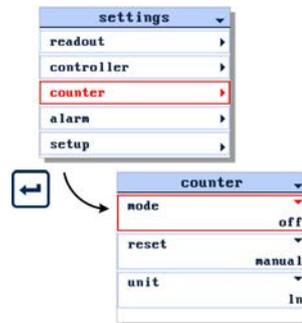
3.2.12 Counter settings screen

To enter the counter settings screen, select the *counter* item from the *settings* menu and press .

From the counter settings screen you can customize the instrument counter. There are three counter modes:

mode	description
off	counter turned off
up	counts up without limit
up to limit	counts up to a programmable limit

Use the  button to return to the measure readout screen.



3.2.13 Set setpoint at counter limit

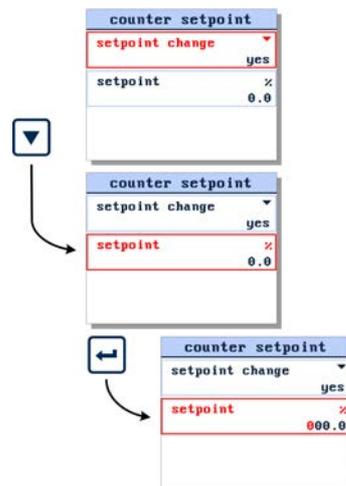
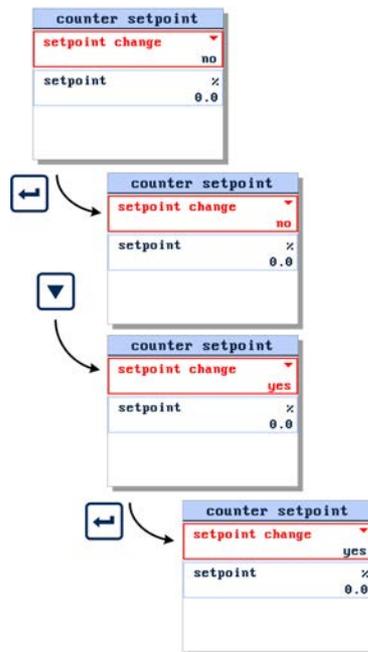
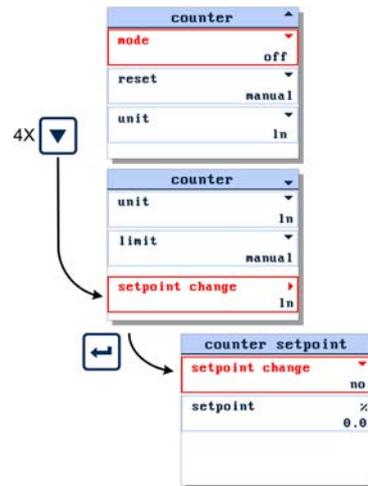
You can program an automatic setpoint which will be activated when the counter limit is reached.

To change this setpoint use the  button to select the *setpoint change* option and press  to enter the counter setpoint settings screen.

When entering the *counter setpoint* settings screen the *setpoint change* parameter is selected. Press  to enter the edit mode.

In the edit mode, use  and  to select 'yes' or 'no'. Press  to exit the edit mode without changes. Press  to confirm your selection and to exit the edit mode.

In the *counter setpoint* settings screen press  to select the *setpoint* parameter. Press  to enter the edit mode.

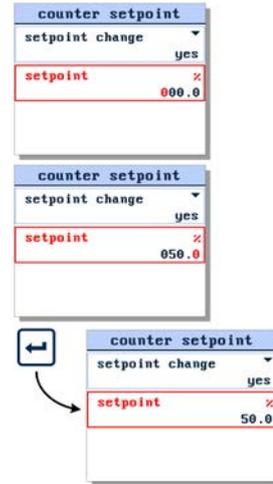


In the edit mode, use and to change each character.

Press to select the next character.

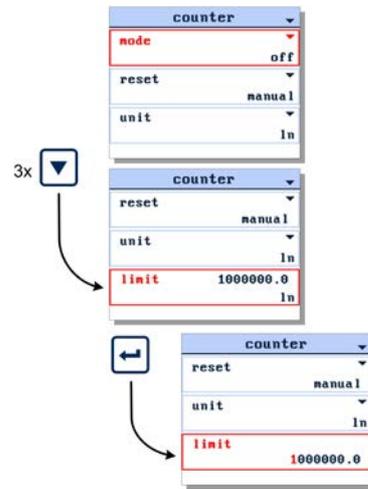
Press to exit the edit mode without changes.

When the final character is changed, press to confirm and to exit the edit mode.



3.2.14 Set counter parameters

To change one of the counter parameters use the and buttons to select the parameter you want to change and press to enter the edit mode.

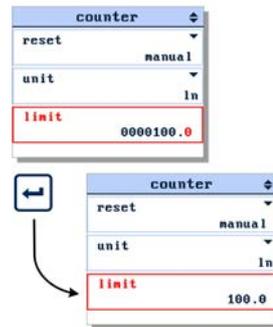


In the edit mode, use and to change each character.

Press to select the next character.

Press to exit the edit mode without changes.

When the final character is changed, press to confirm and to exit the edit mode.



3.2.15 Set counter mode

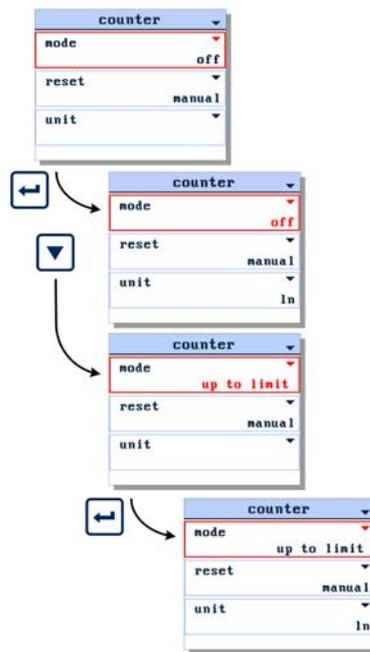
When entering the counter settings screen, the counter mode is selected. Press **[←]** to enter the edit mode. Select a counter mode using **[↑]** and **[↓]**. Press **[↩]** to exit the edit mode without changes. Press **[↵]** to confirm your selection and exit the edit mode.



The counter menu is not available for pressure meters or controllers.



You can find more information about these counter settings in the manual: 9.17.023, this manual is available at the download section of our website: www.bronkhorst.com/downloads



3.2.16 Alarm settings screen

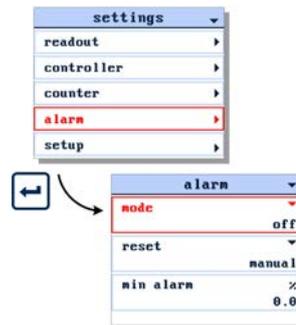
To enter the alarm settings screen, select the *alarm* item from the *settings* menu and press **[↵]**.

From the alarm settings screen you can program the instrument alarm settings. There are four alarm modes:

mode	description
off	alarm is turned off.
power-up	alarm will be activated after power-up
response	alarm will be activated above a programmable difference between setpoint and measure
min/max	alarm will be activated below a minimum and/or above a maximum programmable value



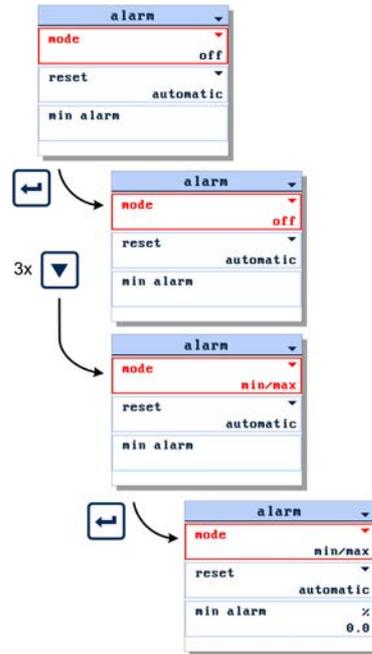
You can find more information about these alarm settings in the manual: 9.17.023, this manual is available at the download section of our website: www.bronkhorst.com/downloads



3.2.17 Set alarm mode

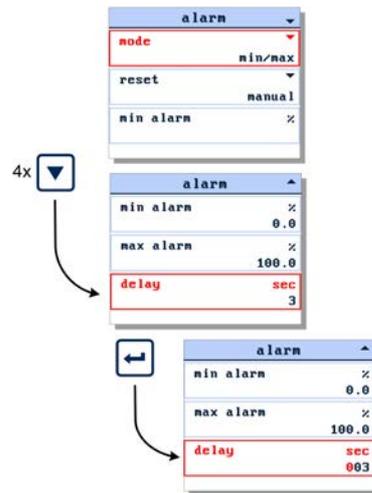
When entering the alarm settings screen the alarm *mode* is selected. Press **↵** to enter the edit mode. Select an alarm mode using **▲** and **▼**. Press **↵** to confirm your selection and exit the edit mode.

Press **↶** to exit the edit mode without changes.



To change one of the alarm mode parameters use the **▲** and **▼** buttons to select the parameter you want to change and press **↵** to enter the edit mode.

Press **↶** to exit the edit mode without changes.



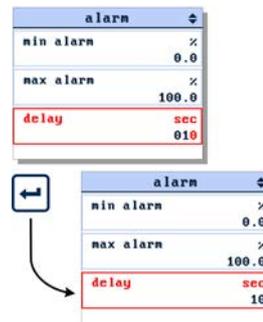
3.2.18 Set alarm mode parameters

In the edit mode, use **▲** and **▼** to change each character.

Press **↵** to select the next character.

When the final character is changed, press **↵** to confirm and to exit the edit mode.

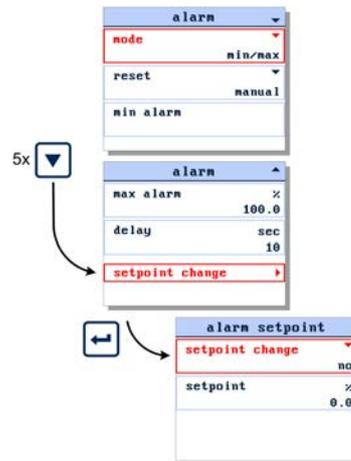
Press **↶** to exit the edit mode without changes.



3.2.19 Set setpoint at alarm

You can program an automatic setpoint which will be activated when an alarm situation occurs.

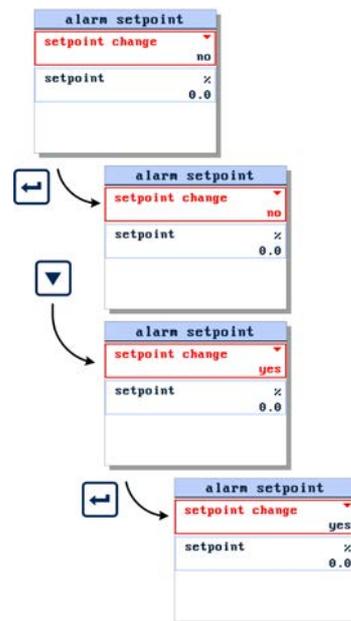
To change this alarm setpoint use the  button to select the *setpoint change* option and press  to enter the alarm setpoint settings screen.



When entering the *alarm setpoint* settings screen the *setpoint change* parameter is selected. Press  to enter the edit mode.

In the edit mode, use  and  to select 'yes' or 'no'. Press  to confirm your selection and to exit the edit mode.

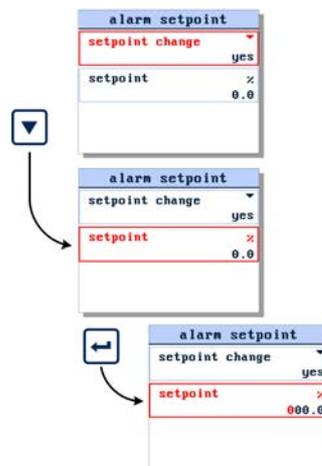
Press  to exit the edit mode without changes.



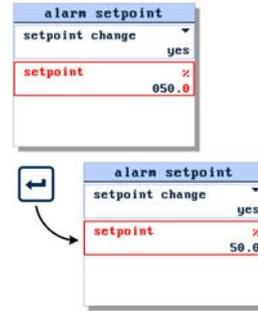
In the *alarm setpoint* settings screen press  to select the setpoint parameter. Press  to enter the edit mode.

In the edit mode, use  and  to change each character. Press  to select the next character.

Press  to exit the edit mode without changes.



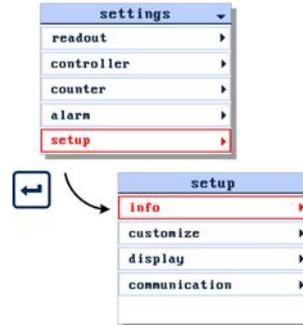
When the final character is changed, press to confirm and to exit the edit mode.



3.2.20 Setup menu

To enter the *setup* screen, select the setup item from the *settings* menu and press . Via the *setup* menu you can:

menu item	description
info	information about connected instrument
customize	customize display information
display	customize display appearance
communication	change communication settings when connected to a bus system



3.2.21 Get instrument information

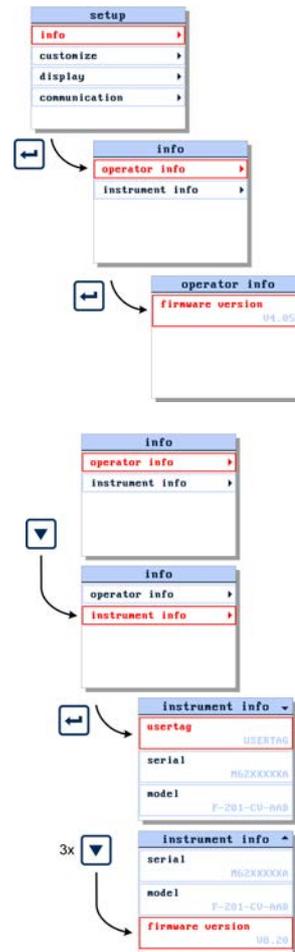
Select the *info* item in the *setup* menu and press . When entering the *instrument info* screen the instrument user tag, serial number and model are displayed.

In the *instrument info* menu you can find the following items.

parameter	editable
usertag	yes
instrument serial number	no
instrument model number	no
instrument firmware version	no
operator firmware version	no

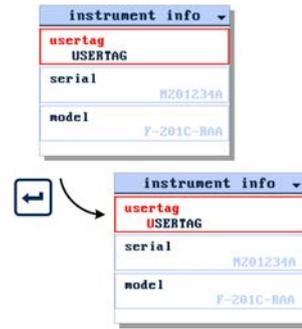
The ▼ or ▲ signs in the upper right corner indicates that not all the menu items fit in the display and that you need to scroll through the menu using the and buttons to view the hidden menu items. Press to enter the selected menu item.

Use the button to return to the measure readout screen.



3.2.22 Change user tag

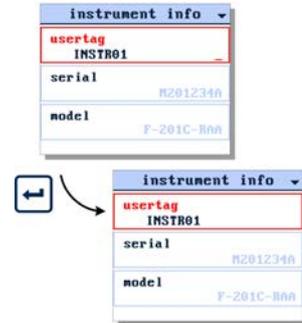
When entering the instrument info screen the *usertag* parameter is selected. Press  to enter the edit mode.



In the edit mode, use  and  to change each character. Press  to select the next character.

Press  to exit the edit mode without changes.

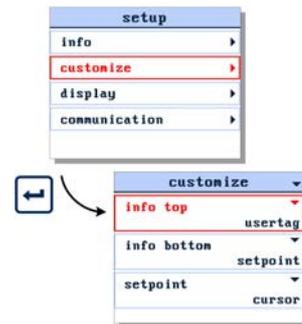
When the final character is changed, press  until the cursor disappears to confirm and to exit the edit mode.



3.2.23 Customize display info

To customize the display information, select the *customize* option in the setup menu and press . In the *customize* menu you can change:

item	description
info top	Info in 'Top line' of readout screen (user tag or serial number.)
info bottom	Info in 'Custom readout 1'.
setpoint	Setpoint edit mode, cursor or steps.
read digits	Number of readout digits.



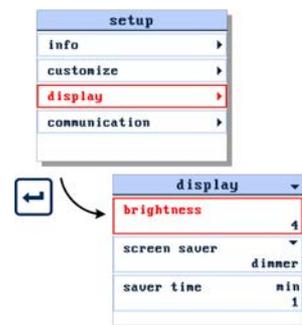
3.2.24 Display appearance

To customize the display appearance, select the *display* item in the *setup* menu and press . In the *customize* menu you can change:

item	description	default
brightness	set display brightness: 0...9	7
screen saver	screen saver type: dimmer/off	off
saver time	time before screen saver becomes active	1 min.



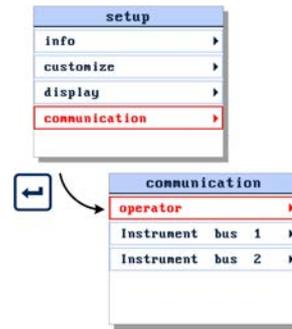
Deactivate screen saver by pressing any of the four buttons one time. This will have no effect on the menu status.



3.3 Communication settings

This display shows information about the communication. The communication display is divided into two sections:

- operator
- instrument (bus 2 and/or bus 1)



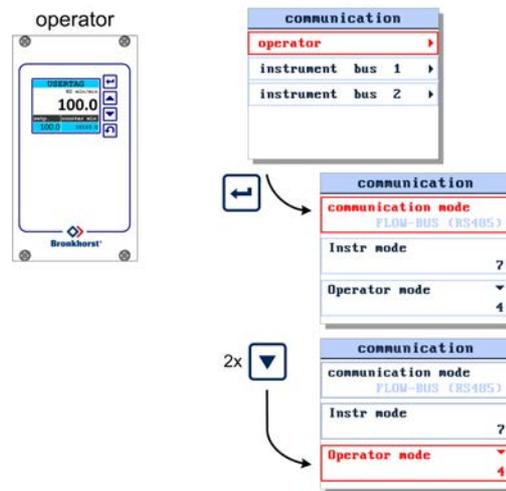
3.3.1 Operator

Change operator node address



When the operator has the same node address as the existing system, or has a FLOW-BUS node address conflict, you can change the operator node address.

From the *setup* menu select the *communication* item and press \leftarrow to enter the communication screen. Press \leftarrow to enter the *operator* screen. Press 2x \downarrow to move to the *operator node* item. Press \leftarrow to enter the edit mode. In the edit mode, use the up \uparrow and down \downarrow to change the operator node address. When required operator node address is visible, press \leftarrow to confirm. During the edit mode you can press escape \rightarrow to exit the edit mode without changes.



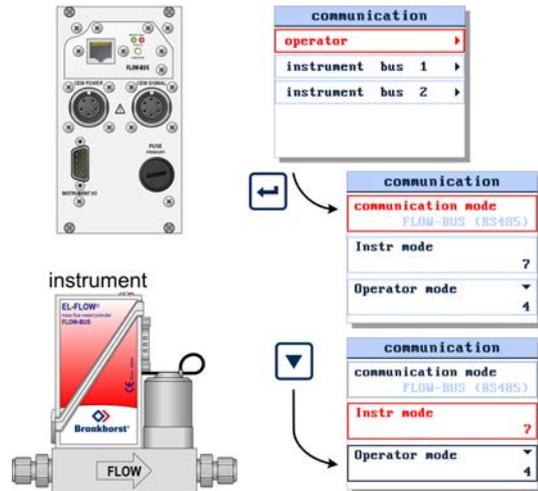
Each **operator** must have a unique node address, else you get a FLOW-BUS node address conflict.

Select instrument node address



In the operator screen you can select a rear module node address or instrument node address (preset), even when there is no connection with the FLOW-BUS system.

From the setup menu select the communication item and press **↵** to enter the communication screen.
 Press **↵** to enter the operator screen. Press 1x **▼** to move to the *instr node* item.
 Then press **↵** to enter the edit mode.
 In the edit mode, use the up **▲** and down **▼** to change and enter **↵** to confirm the instrument node address.
 When the required instrument node address is available, press **↵** to confirm.
 After the conformation the instrument is blinking a short time red and green, so you can see which instrument is selected.
 During the edit mode you can press escape **⏏** to exit the edit mode without savings.

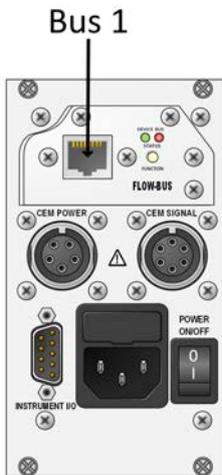


Each instrument must have a unique node address, else you get a FLOW-BUS node address conflict.

3.3.2 Instrument

An instrument can have two instrument FLOW-BUS connections:

- instrument bus 1 (external FLOW-BUS)
- instrument bus 2 (internal FLOW-BUS only E-8000 PID and Ex-Proof meter/controller)



Instrument bus 1



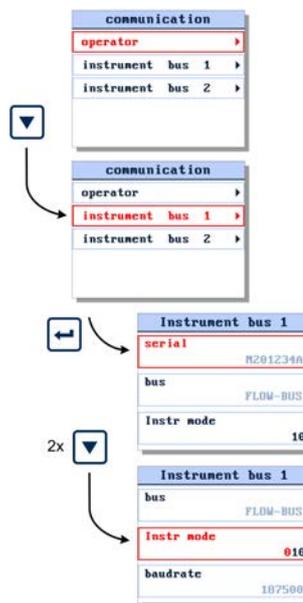
Instrument bus 2

Change instrument node address bus 1 (external FLOW-BUS)



When an instrument on bus 1 (external) is connected to the FLOW-BUS system you can change the rear module node address or instrument node address by means of the operator.

From the *settings* menu select the *communication* item and press **↵** to enter the communication screen. Press 1x **▼** to move to the *instrument bus 1* item. Press **↵** to enter the *instrument bus 1* screen. Press 2x **▼** to move to the *instr node* item. Then press **↵** to enter the edit mode. In the edit mode use **▲** and **▼** to change and **↵** to confirm the new instrument node address. When required instrument node address is confirmed, the instrument is starting to reconnect to the FLOW-BUS system. During the edit mode you can press **⏪** to exit the edit mode without changes.



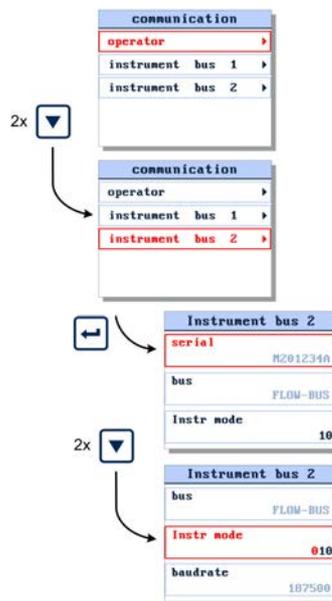
Each **instrument** must have a unique node address, else you get a FLOW-BUS node address conflict.

Change instrument node address bus 2 (internal FLOW-BUS only E-8000 PID and Ex-Proof meter/controller)



When an instrument on bus 2 (internal) is connected to the FLOW-BUS system you can change the rear module node address or instrument node address by means of the operator.

From the *setup* menu select the *communication* item and press **↵** to enter the communication screen. Press 2x **▼** to move to the *instrument bus 2* item. Press **↵** to enter the *instrument bus 2* screen. Press 2x **▼** to move to the *instr node* item. Then press **↵** to enter the edit mode. In the edit mode use **▲** and **▼** to change and **↵** to confirm the new instrument node address. When required instrument node address is confirmed, the instrument is starting to reconnect to the FLOW-BUS system. During the edit mode you can press **⏪** to exit the edit mode without changes.



Each **instrument** must have a unique node address, else you get a FLOW-BUS node address conflict.

3.4 Advanced settings

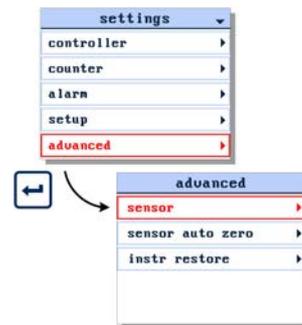
3.4.1 Advanced menu

To enter the advanced settings menu, select *advanced* in the *settings* menu and press \leftarrow . In the advanced settings menu you can:

menu item	description
sensor	change sensor filter settings
auto zero	start sensor auto zero procedure
restore	start restore instrument data procedure



The advanced menu is disabled by default. Refer to section [3.5- Security settings](#) for enabling or password protect this menu item.



3.4.2 Sensor filter settings

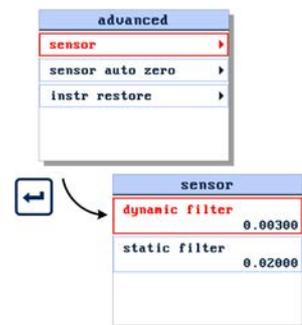
To change the sensor filter settings select *sensor* from the advanced settings menu and press \leftarrow to enter the sensor settings screen.

The sensor filter is split into a dynamic and a static part. Use the \uparrow and \downarrow button to select the *dynamic* or *static* parameter and press \leftarrow to enter the edit mode.

In the edit mode, use \uparrow and \downarrow to change each character. Press \leftarrow to select the next character.

When the final character is changed, press \leftarrow to confirm and to exit the edit mode.

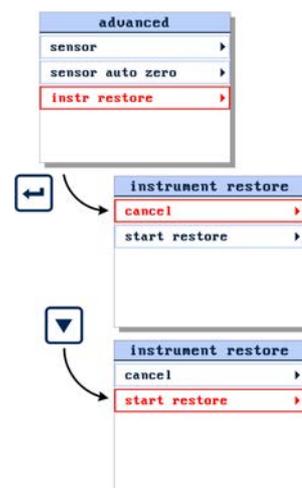
Press \rightarrow to exit the edit mode without changes.



3.4.3 Restore instrument settings

To start the instrument restore procedure, select the *instr restore* item from the advanced settings menu and press \leftarrow to enter.

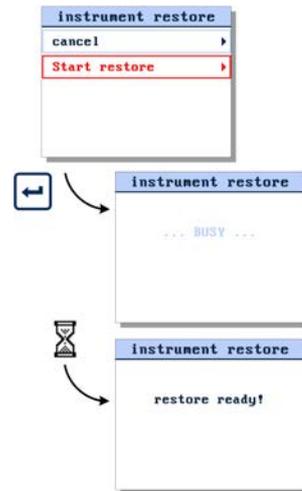
Press \downarrow to select the *start restore* option.



Press  to start the instrument restore procedure.

While the restore procedure is active, the E-8000 will show the message 'BUSY'. When finished it will show 'restore ready!'.

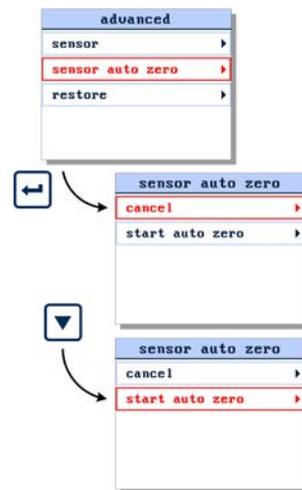
Press any button to return to settings menu.



3.4.4 Sensor auto zero

To start the sensor auto zero procedure, select *sensor auto zero* from the advanced settings menu and press  to enter.

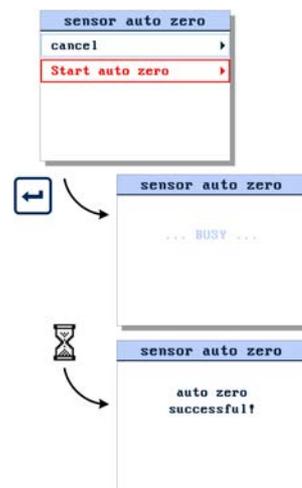
Press  to select the *start auto zero* option.



Press  to start the sensor auto zero procedure.

While the auto zero procedure is active, the E-8000 will show the message '... BUSY ...'. When finished, 'auto zero successful!'.

Press any key to return to settings menu.



3.5 Security settings

3.5.1 Security modes

The security settings screen allows you to define the access of the crucial menu items of the E-8000. For every item, you can choose the following access modes:

item	accessibility
enable	Item is accessible without any restrictions
password	item is accessible after entering a password
disable	Item is not accessible

3.5.2 Enter the security settings screen

From the readout screen press both  and  for 5 seconds till the *enter password* display appears.

The default password is 'abc'. The password can consist of a maximum of 8 characters. For less characters press  till the end of the edit field. Please refer to section [3.5.4 - Change password](#) to change or reset the password.



When you enter a wrong password, the message 'invalid password!' will appear.

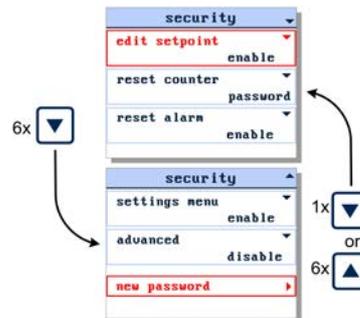


3.5.3 Security items

The security settings screen allows you to define the access of the crucial menu items of the E-8000. For every item, you can choose for enable, disable or password. These settings can be assigned to the following items.

item	accessibility
edit setpoint	edit mode of the setpoint in both 'Custom readout 1 and 2'.
reset counter	counter reset functionality in 'Custom readout 2'.
reset alarm	alarm reset functionality displayed in 'Custom readout 2'.
select instrument	select another instrument on the bus system displayed in 'Custom readout 2'.
settings menu	settings menu.
advanced	'advanced' menu item in the settings menu.

Check section [3.5.2 - Enter the security settings screen](#) how to access this settings screen.



3.5.4 Change password

To change the password, select the *new password* item and press .

In the *new password* input screen press  to activate the new password edit mode.

You can enter a maximum of 8 characters. For less characters, press  till the end of the edit field.

After changing the password press  to select the *confirm* item. Then press .

Now the new password is stored and should be used to enter the password protected items.

Press any key to return to security settings screen.



3.5.5 Reset password

From the readout screen press both  and  for 5 seconds till the *enter password* display appears.

Again press both  and  for 5 seconds till the *reset password* display appears.

The *reset password* display will show a 10 character long 'bht key'. This is your encrypted password. Send this key to your local agency and they will send you, after validation of your request, a reset key. Enter this 10 character reset key in the *reset key* field. The password will now be reset to its default value. Press any key to return to the readout screen.

 To avoid unauthorized access change the default password. Check section [3.5.4 - Change password](#).

 If you enter the wrong key, the message 'invalid reset key!' will appear. Check the key and try again.

Press any key to return to the readout screen.



4 Modules

4.1 Power supply

Each E-8000 power supply housing incorporates two power supply connectors. System setup is such that the instruments that belong to the system can be powered. For other applications or modifications your supplier should be consulted. The power input incorporates an on/off switch and a fuse.

4.1.1 Model key power supply

E-8

N	N	N
---	---	---

 -

A

 -

N	A
---	---

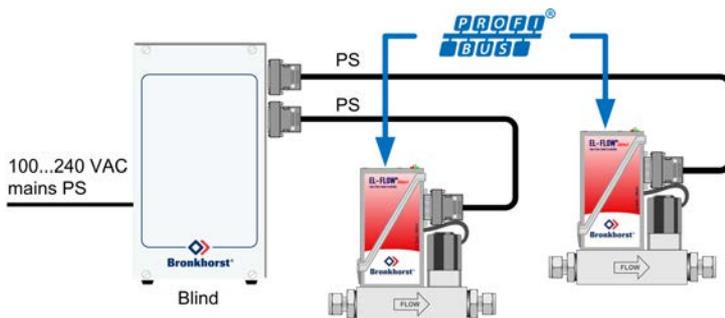
 - ...

Code	Rear modules
0	FLOW-BUS Power Supply (only at 1st or 2nd Supply unit)
A	2x 9pSub Instrument Power Supply

Code	Front
0	blind

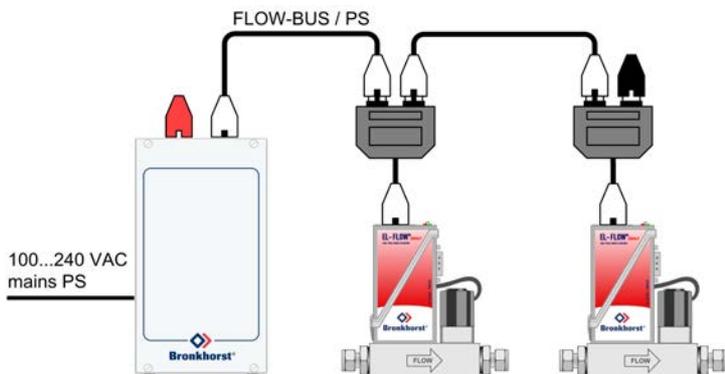
4.1.2 Electrical connection

Below you find an example of a blind power supply for two (PROFIBUS) Mass Flow Controllers. The model key for this example is **E-8501-0-0A**.



4.1.3 Bus powering

Below you find an example of a blind power supply for two FLOW-BUS Mass Flow Controllers. The model key for this example is **E-8501-R-00**

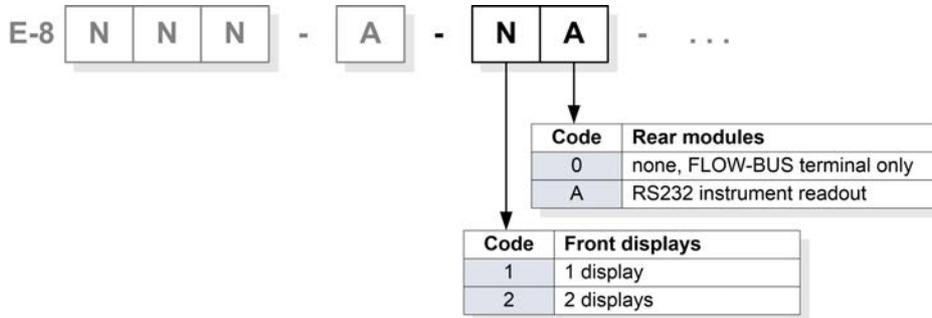


The 19" housing can be equipped with a dual power supply. This means that the maximum power $P_{max}=2 \times 30 \text{ Watt}$. Please check the total power consumption of your instruments. You can use the calculation table in section [2.6-Power consumption](#).

4.2 Readout and control

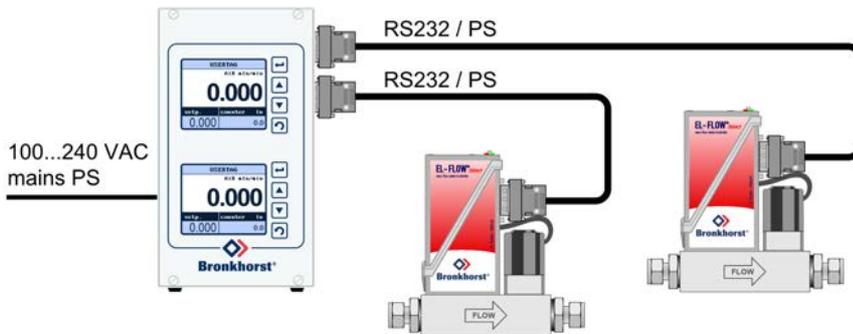
E-8000 Readout and Control modules have one or two displays in the front panel with each 4 control buttons for operation of attached instruments and for editing the display settings. The modules are either suited for RS232 or FLOW-BUS communication.

4.2.1 Model key readout and control



4.2.2 Instrument terminal

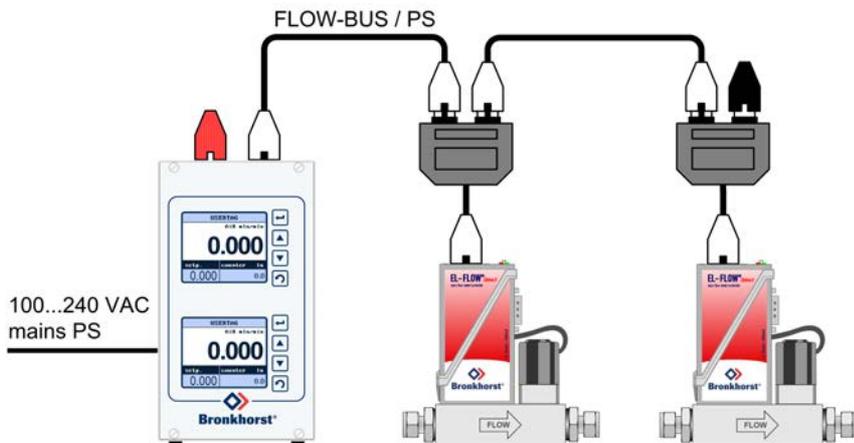
Below you find an example of an instrument terminal with 2 Mass Flow Controllers. The model key for this example is: **E-8501-0-2A**



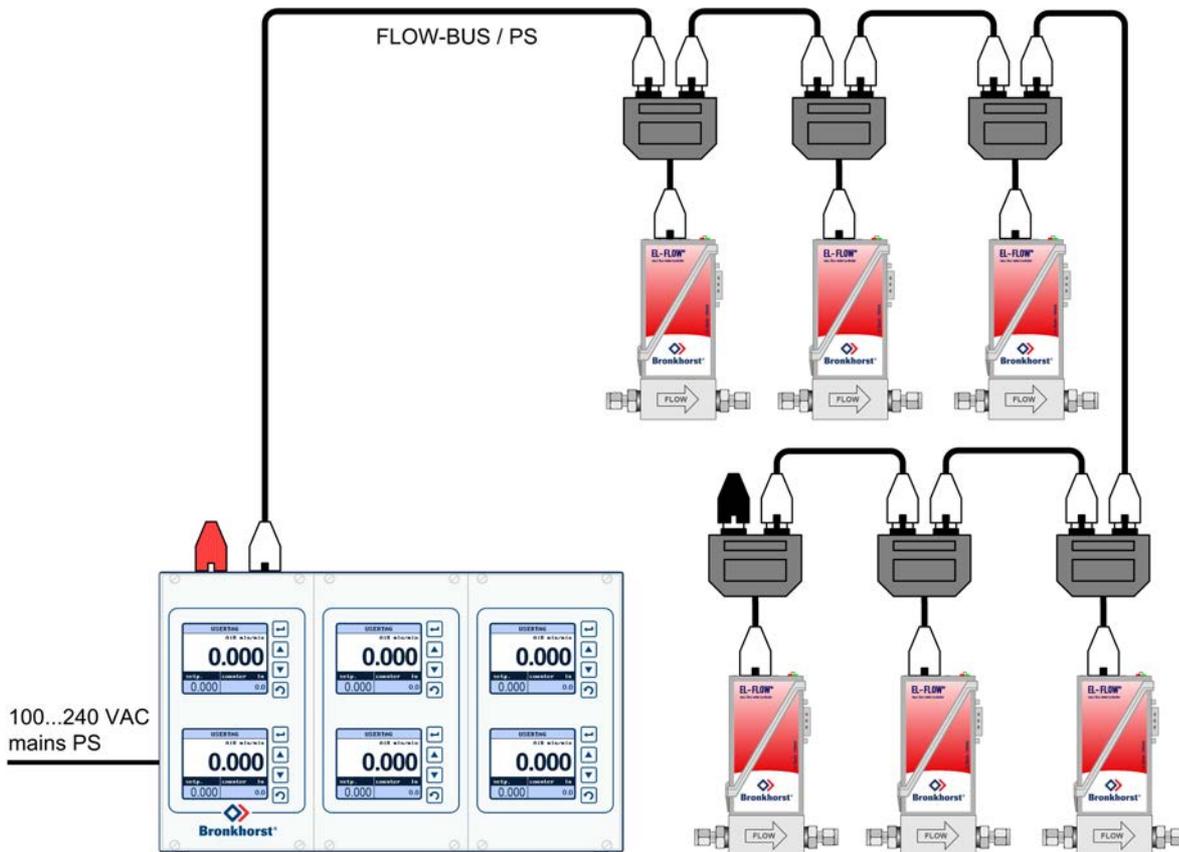
For further instructions about the RS232 interface see manual 9.17.027 Manual 'RS232 interface with FLOW-BUS protocol for digital instruments'. This manual is available at the download section of our website: www.bronkhorst.com/downloads.

4.2.3 FLOW-BUS terminal

Below you find an example of a FLOW-BUS setup with 2 Mass Flow Controllers.
The model key for this example is: **E-8501-R-20**



Below you find an example of a FLOW-BUS setup with 6 Mass Flow Meters.
The model key for this example is: **E-8101-R-20-20-20**



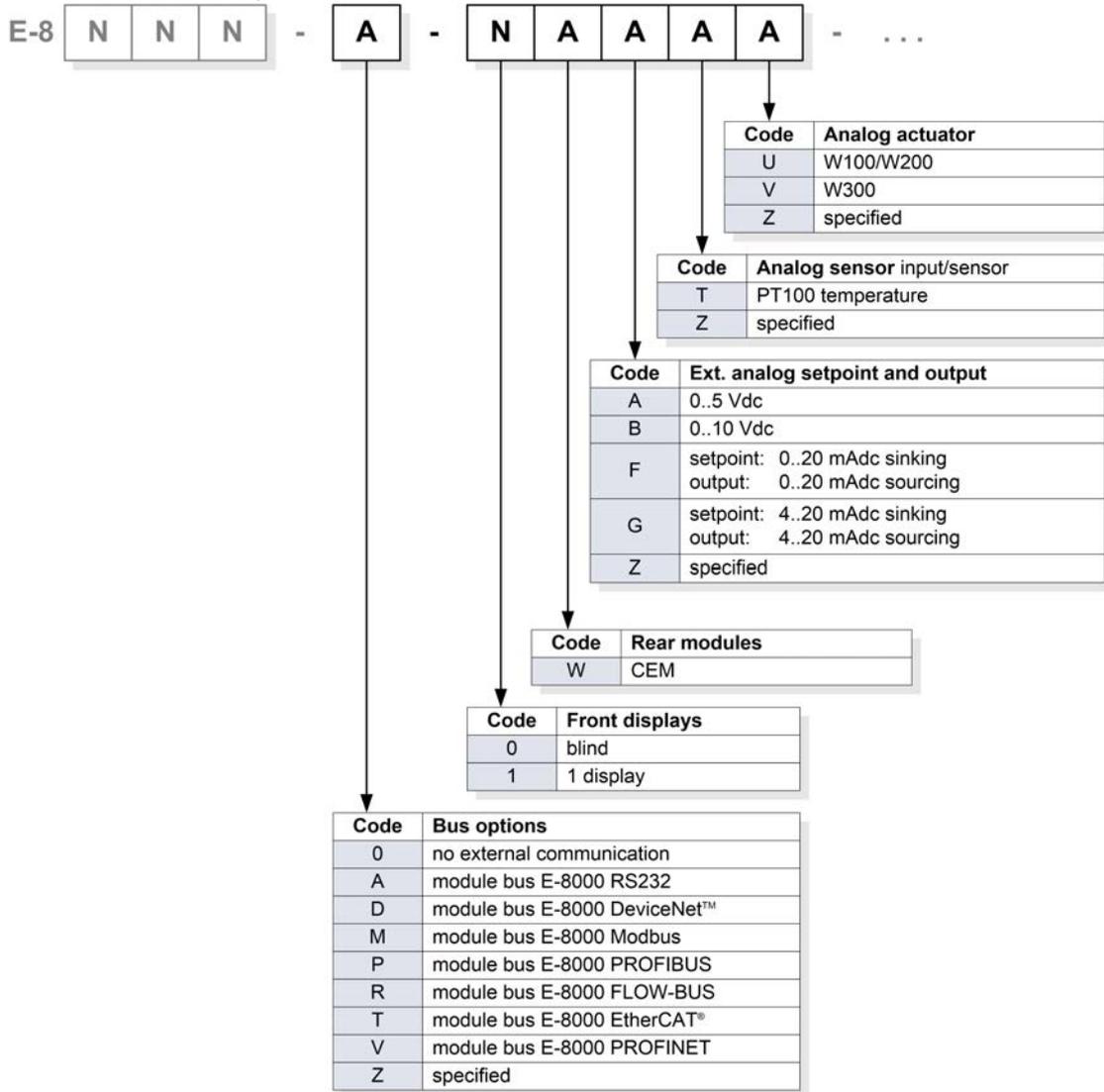
For node addressing and further instructions about the FLOW-BUS interface see manual 9.17.024 Manual 'FLOW-BUS interface for digital instruments'. This manual is available at the download section of our website:
www.bronkhorst.com/downloads.

4.3 CEM controller

E-8000 CEM controller for Controlled Evaporation and Mixing systems are used for temperature control of the heat exchanger of the vapor control device. The temperature can be set using the push buttons on the front panel or by means of an external

analog setpoint signal. As an option the temperature can be monitored and adjusted via an integrated fieldbus interface.

4.3.1 Model key CEM controller



4.3.2 Fieldbus options for CEM controller

The basic analog version of the CEM controller has a 9-pin D-socket at the rear panel for input/output of the temperature of the heat exchanger. Optionally the modules can be equipped with an interface board for digital communication. See the picture below for the available options.



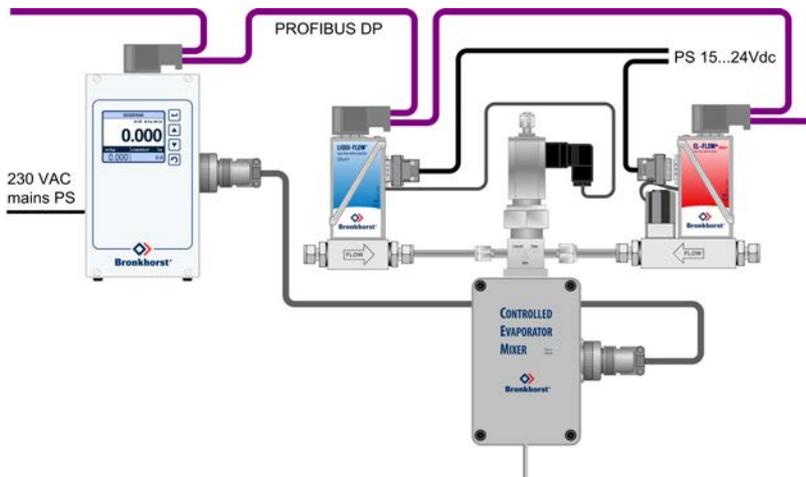
The fieldbus connection on the CEM controller cannot be used to power any instruments connected to the bus.



Consult the fieldbus specific manual for fieldbus address and baud rate configuration options.

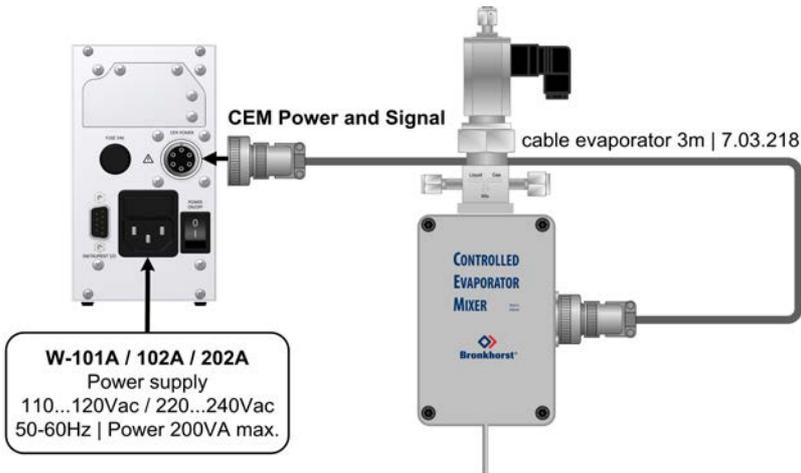
4.3.3 Electrical connection for CEM controller

Below you find an example of a CEM controller-system based on PROFIBUS DP communication with 2 Mass Flow Controllers. The model key for this E-8000 with display example is: **E-8503-P-1WATU**



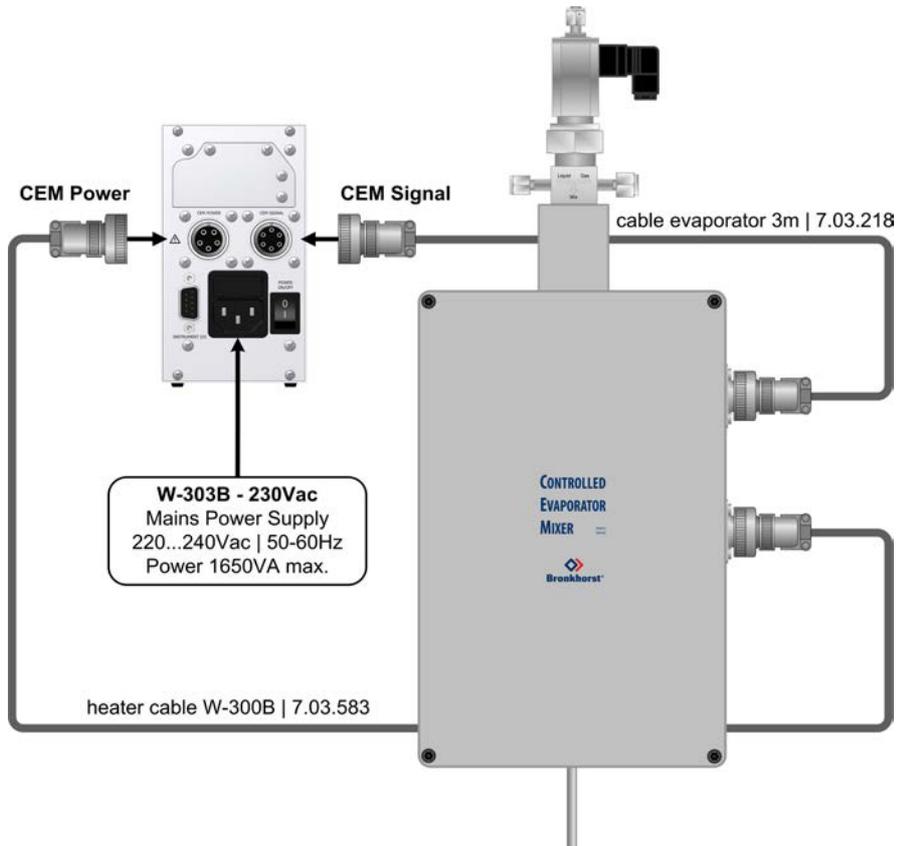
4.3.4 Rear panel connection for CEM controller

1. Powering for CEM W-101A / W-102A / W-202A



The "CEM power and signal" connector is a 44VAC power outlet. Use a standard Bronkhorst® cable 7.03.218 for connecting the CEM W-101A, W-102A and the W-202A to the heater. The  symbol on the rear panel of the E-8000 indicates the location of the power outlet.

2. Powering for CEM W-303B



The "CEM power" connector is a mains power outlet. Use a standard Bronkhorst® cable 7.03.583 for connecting the CEM W-303B, W-102A and the W-202A to the heater. The  symbol on the rear panel of the E-8000 indicates the location of the power outlet.

4.3.5 Electrical properties for CEM controller

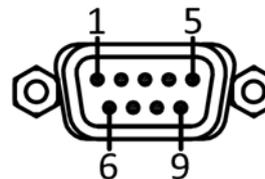
Art. No.	Module Rear Type	Label Information				
		Power Supply	Power max.	Fuse mains/primary	Fuse secondary	Tmax
4.08.242	E-8005-x-xWxxU/3	110...120V	200VA 50...60Hz	T2A I2t >30A <i>Littelfuse 0213002.MXP or equivalent</i>	T4A	40°C
4.08.243	E-8003-x-xWxxU/3	220...240V	200VA 50-60Hz	T1A I2t >10A <i>Littelfuse 0213001.MXP or equivalent</i>	T4A	40°C
4.08.245	E-8003-x-xWxxV/3	220...240V	1650VA 50-60Hz	T10A	-	40°C
4.08.248	E-8005-x-xWxxU/0	110...120V	200VA 50-60Hz	T2A I2t >30A <i>Littelfuse 0213002.MXP or equivalent</i>	T4A	40°C
4.08.249	E-8003-x-xWxxU/0	220...240V	200VA 50-60Hz	T1A I2t >10A <i>Littelfuse 0213001.MXP or equivalent</i>	T4A	40°C
4.08.251	E-8003-x-xWxxV/0	220...240V	1650VA 50-60Hz	T10A	-	40°C

4.3.6 Instrument I/O connection for CEM controller

Connection to remote equipment, I/O

The male I/O (sub-miniature 9-pin) D-connector has the following pin configuration:

Pin number	Description
1	RS485(B)
2	analog output
3	analog input
4	0V power
5	+ actuator out / special
6	RS485(A)
7	not connected
8	0V sense
9	shield



Male 9-pin connector
(view from connection side)

Analog input/output signals

Analog input signals should be connected to pin 3 (+) and 0V power.

Analog output signals are available at pin 2 (+) and 0V power.

Signals are according to one of the Bronkhorst® standards. The model configuration contains a code, describing the input/output signals.

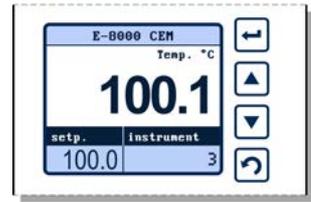


- Max. load current output (sourcing) : 375 Ohm
- Min. load voltage output : 10 kOhm
- Input load resistance (voltage) : 22K4
- Input load resistance (Current) (sinking) : 250 Ohm

4.3.7 Operation of CEM controller module

Upon connection of the power and signal cables, the CEM controller module is ready to control the temperature of the heat exchanger. The temperature range of 0 to 200°C corresponds with 0 to 5 V I/O signal (4 to 20 mA for current I/O).

For operation of the user interface we refer to **chapter 3** of this manual.



For further instructions about the CEM system see manual 9.17.126 Manual CEM . This manual is available at the download section of our website: www.bronkhorst.com/downloads.

4.4 Ex-Proof modules

The E-8000 Ex-Proof modules have been designed for powering and signal conversion of intrinsic safe meters. Optionally a valve drive circuit can be incorporated in the system. Depending on the limits of the valve, the output stage for the valve can also be made intrinsically safe by using an isolating repeater.

Without isolating repeater a valve (XC) with "II 2 G (ATEX group and category) - Ex e mb II T4" (CELENEC) classification can be powered.

With isolating repeater a valve (XB) with "II 1 G/D (ATEX group and category) - Ex ia IIC T6" (CELENEC) classification can be powered.

The E-8000 Ex-Proof system standard contains an Ex-Proof module and a power supply module.

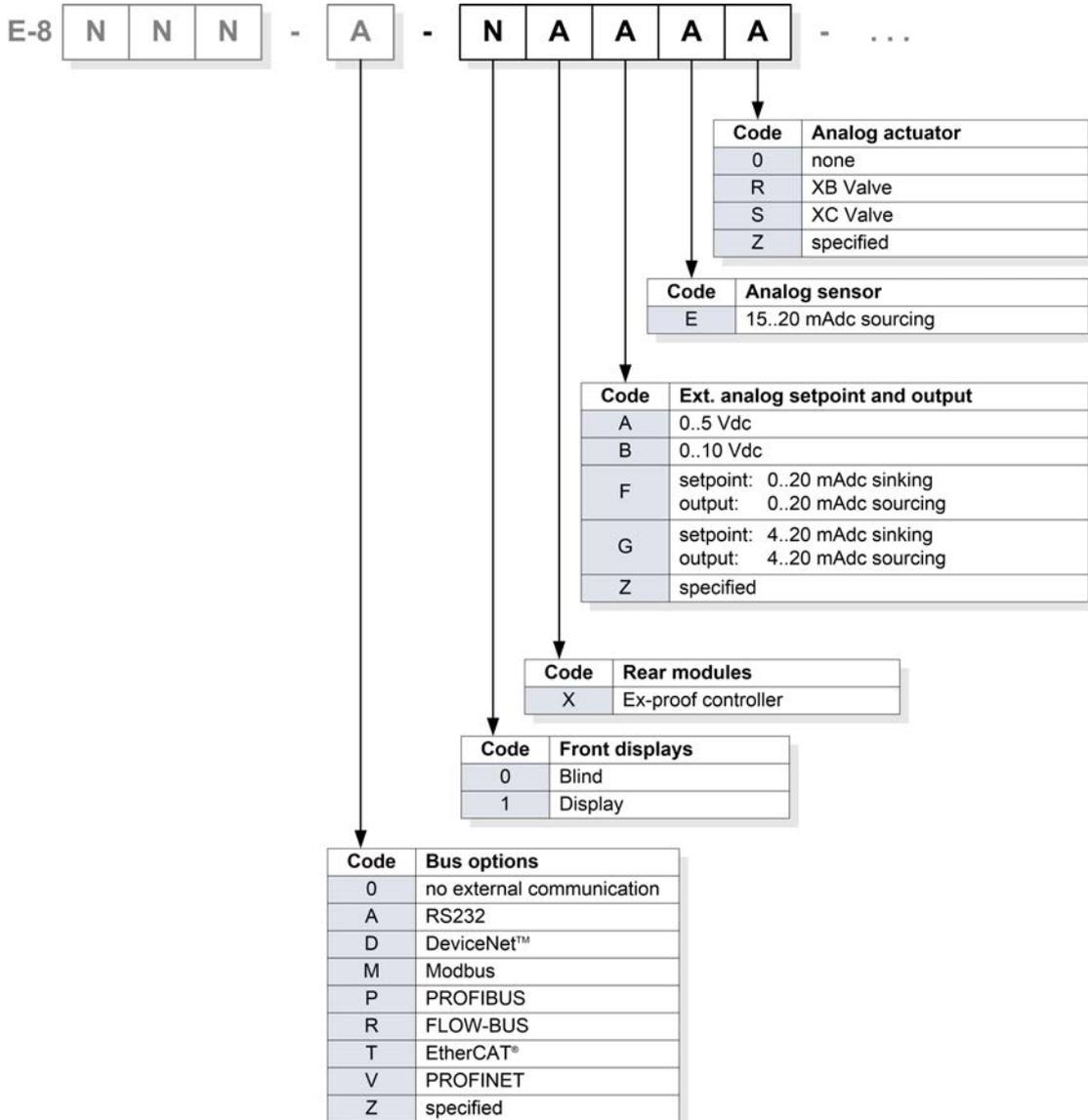
It is possible to use the Ex-Proof module as a stand-alone unit. In this case the power supply must be provided by the user (+24 Vdc ± 10%) via the instrument I/O connector at the rear of the module. Optional the system can be equipped with an integrated fieldbus interface.

Because the intrinsic parts of the Ex-Proof modules are completely protected, this will not affect the safety and performance of the Ex-Proof modules.



The E-8000 Ex-Proof module itself is not explosion protected, but is developed to control explosion protected equipment. It must be installed outside the ATEX zone.

4.4.1 Model key Ex-Proof modules



4.4.2 Intrinsic safe electronic units

4.4.2.1 Transmitter supply unit for flow sensors

Power supply for intrinsic safe flow sensor, providing galvanic isolation between input, output and power supply.

Manufacturer : R. Stahl Schaltgeräte GmbH
Type : ISPac 9260/13-11-10

Type of protection :  II 3 (1) G Ex nA [ia Ga] IIC T4 Gc

Certificate no. : BVS 17 ATEX E 087 X

U_o = 25.2 V
I_o = 93 mA
P_o = 587 mW
C_o ≤ 107 nF (IIC) / ≤ 820 nF (IIB)
L_o ≤ 2 mH (IIC) / ≤ 4 mH (IIB)
C_i = negligible
L_i = negligible

4.4.2.2 Isolating repeater for XB coil

Repeater for isolating the output of the controller circuit and the (XB) valve.

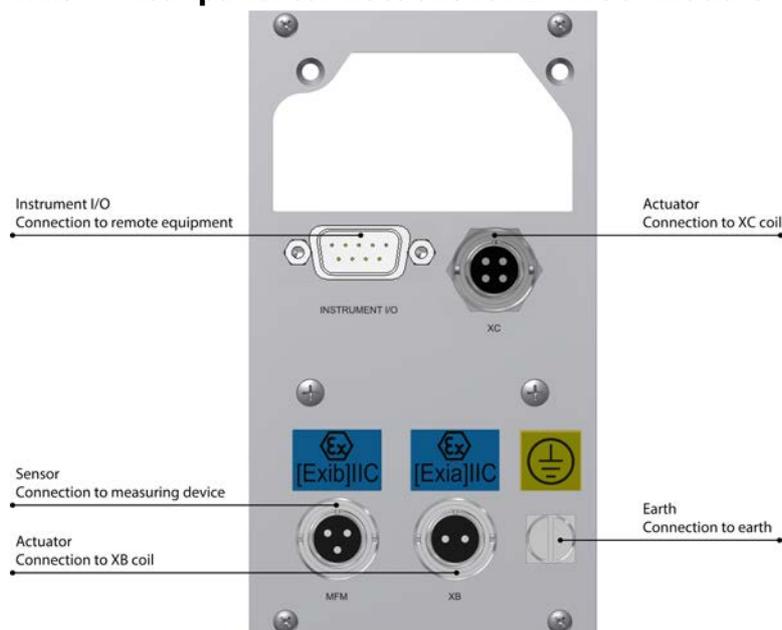
Manufacturer : R. Stahl Schaltgeräte GmbH
Type : ISPac 9167/**-11-00

Type of protection :  II 3 (1) G Ex nA [ia] IIC T4

Certificate no. : BVS 04 ATEX E 082 X

U_o = 25 V
I_o = 99 mA
P_o = 613 mW
C_o ≤ 110 nF (IIC) / ≤ 840 nF (IIB)
L_o ≤ 2.5 mH (IIC) / ≤ 11 mH (IIB)
C_i = negligible
L_i = negligible

4.4.3 Rear panel connections for Ex-Proof module

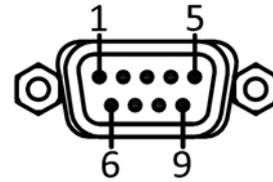


4.4.3.1 Instrument I/O

Connection to remote equipment, I/O

The male I/O (sub-miniature 9-pin) D-connector has the following pin configuration:

Pin number	Description
1	RS485(B)
2	analog output
3	analog input
4	0V power
5	+ actuator out / special
6	RS485(A)
7	not connected / for external +24Vdc power supply
8	0V sense
9	shield



Male 9-pin connector
(view from connection side)

Analog input / output signals.

Analog input signals should be connected to pin 3 (+) and 0V power.

Analog output signals are available at pin 2 (+) and 0V power.

Signals are according to one of the Bronkhorst standards. The model configuration contains a code, describing the input/output signals.



- Max. load current output (sourcing).	: 375 Ohm
- Min. load voltage output	: 10 kOhm
- Input load resistance (voltage)	: 22K4
- Input load resistance (Current) (sinking)	: 100 Ohm

Power supply (in case of stand-alone)

Power supply (+24Vdc \pm 10%) must be connected to pin 7 (+) and pin 4 (0V power)

4.4.3.2 Sensor connection

Connection to measuring device

The + and - current signal input is intended for loop powered transducers. The 3-pin female connector with bayonet locking has the following pin configuration:

Pin number	Description
1	+ 15 - 20 mA
2	- 15 - 20 mA
3	not connected



view from connection side

4.4.3.3 Valve connection XB

Connection to XB valve

Only XB type valves may be connected. Consult the label on the module for the correct valve model. The 2-pin female connector with bayonet locking has the following pin configuration:

Pin number	Description
1	0 valve
2	+ valve (0..39 mA)



view from connection side

4.4.3.4 Valve connection XC

Connection to XC valve

Only XC type valves may be connected. Consult the label on the module for the correct valve model. The 4-pin female connector with bayonet locking has the following pin configuration:

Pin number	Description
1	0 valve
2	+ valve (0..200 mA)



view from connection side

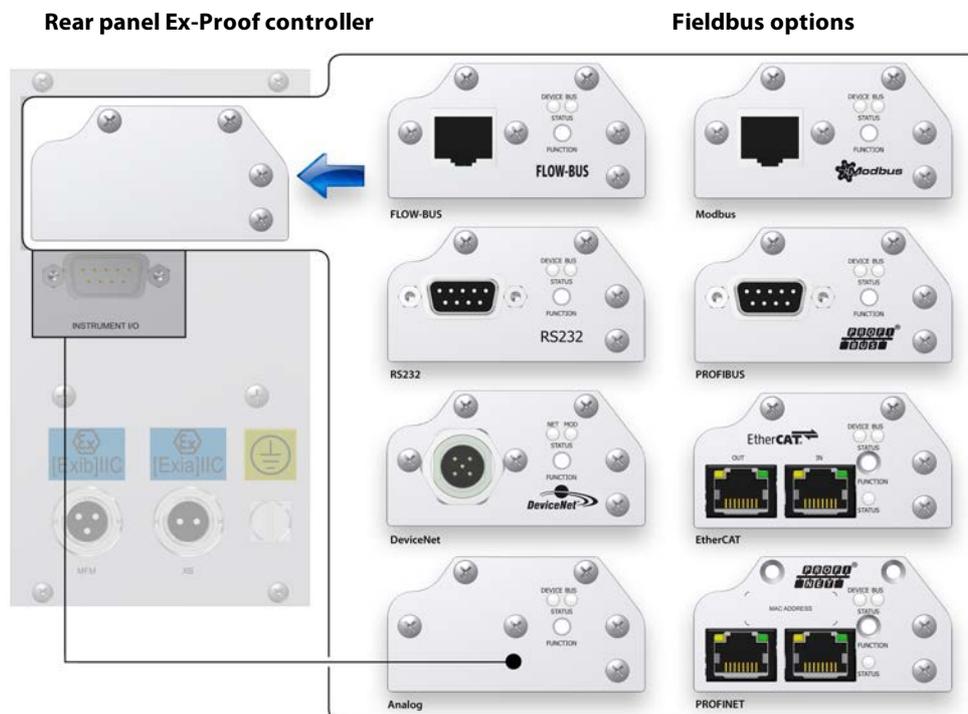
In case of valve XC, the module is equipped with an additional 400 mA fuse according IEC 60127-3, to meet the special conditions for safe use of the applied valve coil.

4.4.4 Fieldbus options for Ex-Proof module

Optionally the Ex-Proof modules can be equipped with an interface board for digital communication.

Communication only for Ex-Proof instrument, no communication possible with other instruments within the network (no master function).

See the picture below for the available options.



The fieldbus connection on the Ex-Proof module cannot be used to power any instruments connected to the bus.



Consult the fieldbus specific manual for fieldbus address and baud rate configuration options.

4.4.5 Electrical connection for Ex-Proof module

The hook-up diagrams can be found at chapter [1.2 Other documents](#)

4.4.6 Electrical properties for Ex-Proof module

General specifications

Specification	Range
Operating temperature	0 .. 40°C
Input Power Supply	+24 Vdc ± 10%
Placement	Outside any ATEX zone
Output for valve with XB-coil (intrinsic safe)	0 .. 39 mA
Output for valve with XC-coil	0 .. 250 mA
Max. Power consumption (excl. display and field bus) MFM	2.6 W
Max. Power consumption (excl. display and field bus) MFM + XB	3.6 W
Max. Power consumption (excl. display and field bus) MFM + XC	8.6 W

4.4.7 Cables

4.4.7.1 General

All Bronkhorst® Ex-Proof cables applicable for E-8000 systems comply with the requirements of IEC 60079-14.

4.4.7.2 Cable for sensor

For Ex-Proof applications, cables must comply with the requirements of IEC 60079-14. In case an equivalent cable is used instead of the standard Bronkhorst® cable, this cable must meet the requirements in the table below.

Bronkhorst recommends using two-wire Lapp Unitronic LiYCY shielded 0,25 mm² cable or equivalent.

Parameter	Description	Requirement IEC 60079-14	Lapp Unitronic LiYCY	Unit
C_{cable}	capacity cable	<200	120	pF/m
L_{cable}	inductivity cable	<1	0.65	μH/m
R_{cable}	resistance cable		0.0799	Ω/m
$L_{\text{cable}}/R_{\text{cable}}$	ratio L/R	<30	8.14	μH/Ω

The maximum voltage loss (@ 15-20 mA) across the standard Bronkhorst® cable: $U_{\text{loss}} = 1.6 \text{ mV/m}$.

The maximum allowed cable length for the sensor is 400 meter.

4.4.7.3 Cable for valve XB/XC

The maximum cable length (Lapp Unitronic LiYCY shielded 0,25 mm² cable) for the XB/XC-coil is 150 meter.

4.4.8 EMC and intrinsic safe circuits

Screens in cables used for intrinsic safe circuits should be earthed at one point only. For good EMC behavior however, it is essential that the point of earth is chosen according to the setup at which the system was tested.

Follow the guidelines for electrical hook-up of sensors (flow) and valves (XC, XB).

4.4.9 Operation of Ex-Proof controller module

Upon connection of the power and signal cables, the Ex-Proof controller module is ready for read out of the ATEX sensor and / or to control the ATEX XB/XC valve.

For operation of the user interface, refer to section [User interface](#).



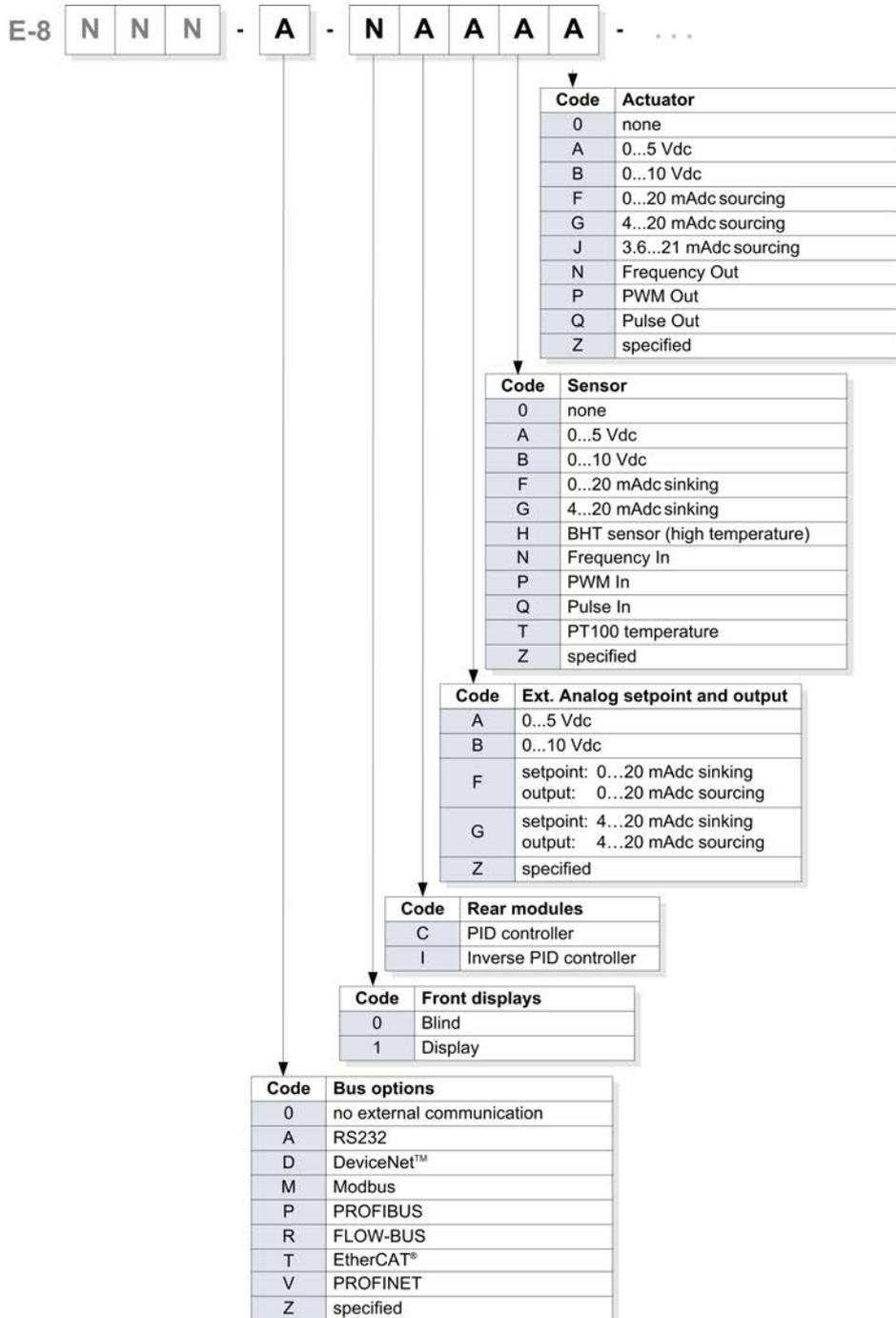
For further instructions about ATEX instruments, see manual 9.17.028 'Explosion proof Flow measurement and control ATEX'. This manual is available at the download section of our website:

www.bronkhorst.com/downloads.

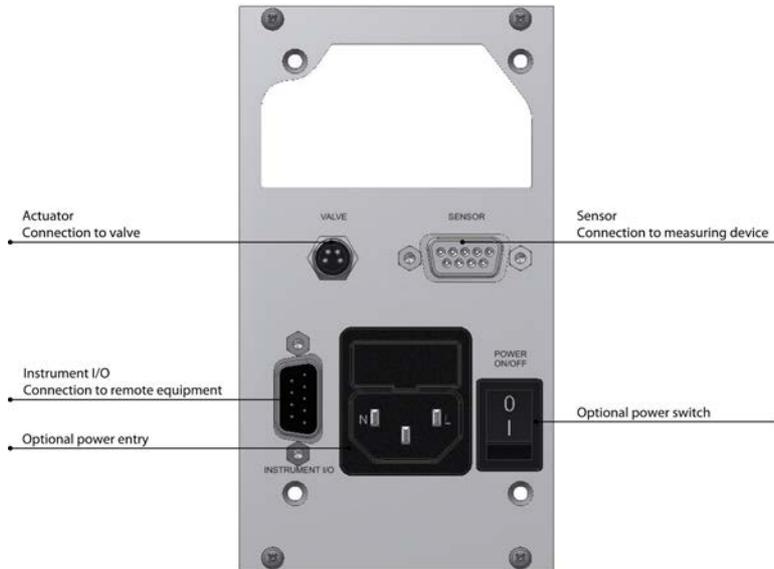
4.5 PID controller

E-8000 PID controller is a module for (digital) external temperature, flow and pressure sensors and external actuators. The module can measure different types of external sensors and can control different types of external actuators. The temperature, flow and pressure can be set using the push buttons on the front panel or by means of an external analog setpoint signal. Optionally the system can be equipped with an integrated fieldbus interface.

4.5.1 Model key PID controller



4.5.2 Rear panel connections for PID controller

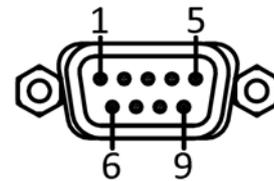


4.5.2.1 Instrument I/O connection for PID controller

Connection to remote equipment, I/O

The male I/O (sub-miniature 9-pin) D-connector has the following pin configuration:

Pin number	Description
1	RS485(B)
2	Analog output
3	Analog input
4	0V power
5	+ actuator out / special
6	RS485(A)
7	Not connected / for external +24 Vdc power supply
8	0V sense
9	Shield



Male 9-pin connector
(view from connection side)

Analog input/output signals

Analog input signals should be connected to pin 3 (+) and 0V power.

Analog output signals are available at pin 2 (+) and 0V power.

Signals are according to one of the Bronkhorst® standards. The model configuration contains a code, describing the input/output signals.



- Max. load current output (sourcing) : 375 Ohm
- Min. load voltage output : 10 kOhm
- Input load resistance (voltage) : 22K4
- Input load resistance (Current) (sinking) : 100 Ohm

Power supply (in case of stand-alone)

Power supply (+24 Vdc ± 10%) must be connected to pin 7 (+) and pin 4 (0 V power)

4.5.2.2 Actuator connection for PID controller

Connection to valve

The 4P M8 connector has the following pin configuration:

Pin number	Description
1	+Us
2	Special2
3	Valve out (0...250mA)
4	0V power



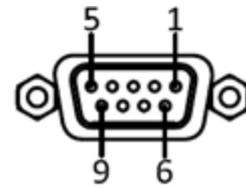
*4-pin M8 connector
(view from connection side)*

4.5.2.3 Sensor connection for PID controller

Connection to measuring device.

The female (sub-miniature 9-pin) D-connector has the following pin configuration:

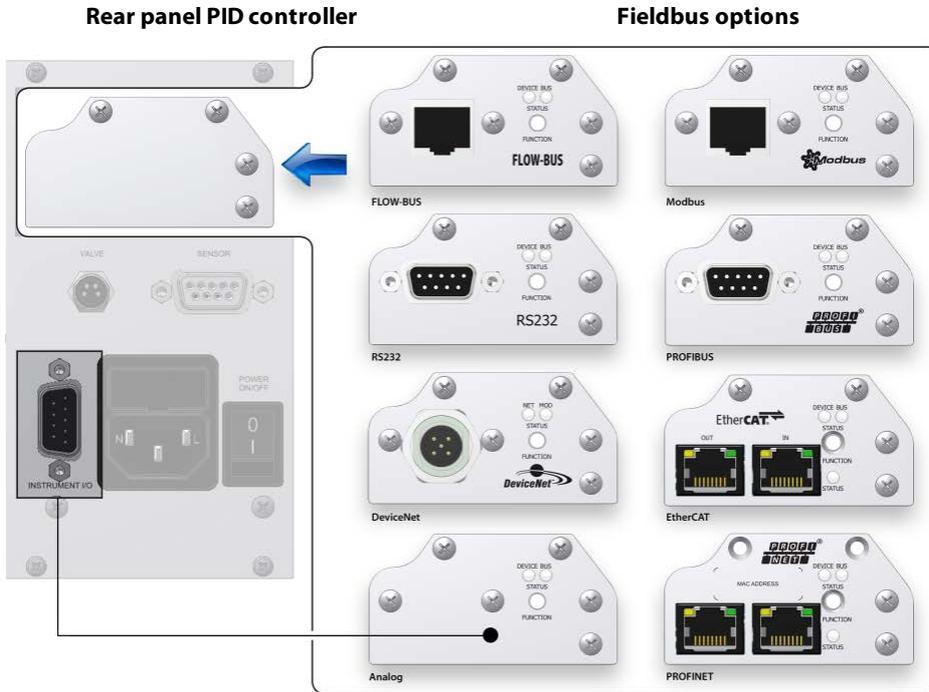
Pin number	Description
1	Digital in
2	Analog in
3	PT100 in
4	0V power
5	PT100 out
6	PT100 sens
7	+Us
8	0V power
9	Shield



*Female 9-pin connector
(view from connection side)*

4.5.3 Fieldbus options for PID controller

The basic analog version of the PID controller has a 9-pin D-socket at the rear panel for input/output of the temperature/flow/pressure and other sensor signals. Optionally the modules can be equipped with an interface board for digital communication. See below picture for the available options.



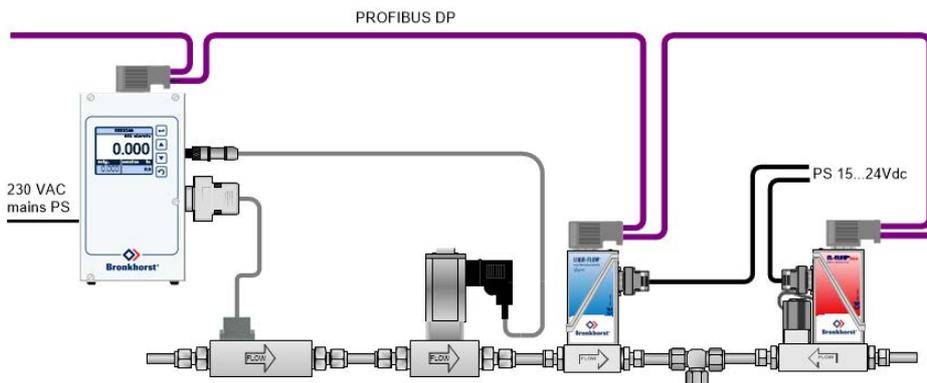
The fieldbus connection on the PID controller cannot be used to power any instruments connected to the bus.



Consult the fieldbus specific manual for fieldbus address and baud rate configuration options.

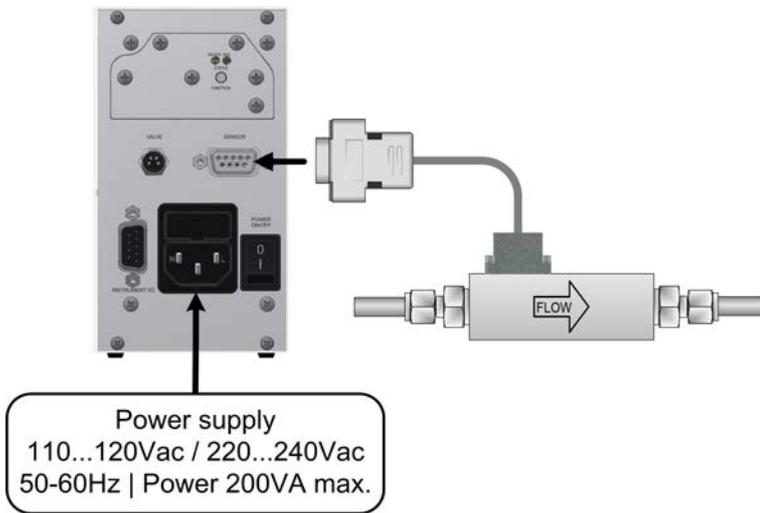
4.5.4 Electrical connection for PID controller

Below you find an example of a PID controller-system based on PROFIBUS DP communication with 2 Mass Flow Controllers. The Model key for this E-8000 with display example is: **E-8503-P-1CAAA**



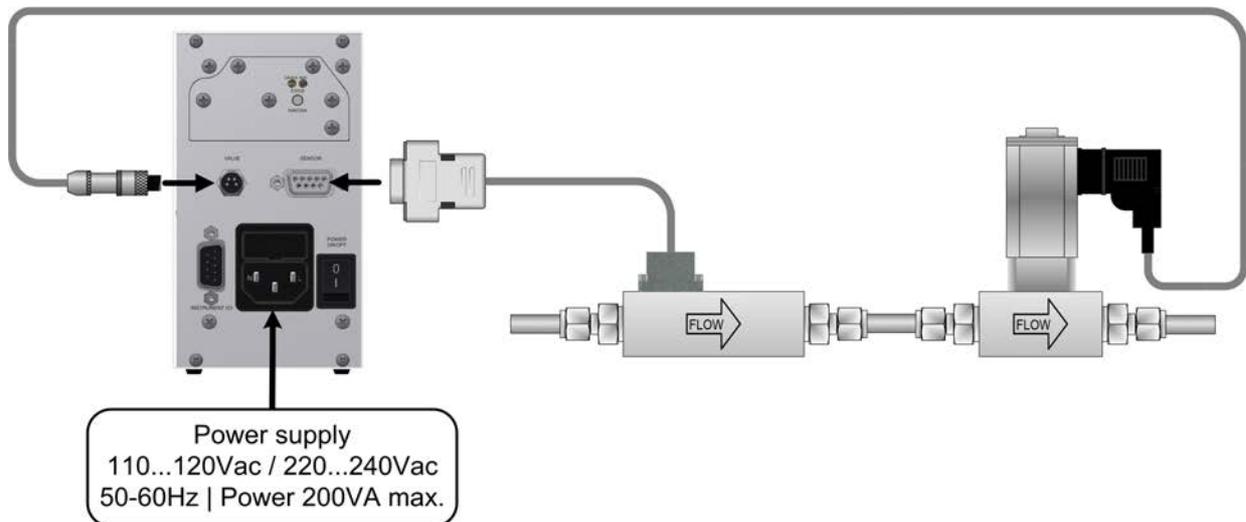
4.5.5 How to connect an instrument

1. Powering for PID meter



If you connect a sensor to the E-8000 PID you can use the PID for measuring the sensor signal.

2. Powering for PID controller



If you connect a sensor and an actuator to the E-8000 PID you can use the PID to control and measure the flow through the sensor.

4.5.6 Electrical properties for PID controller

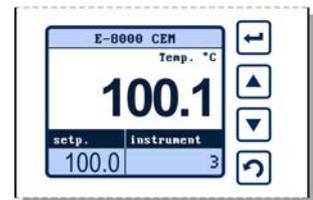
General specifications

Specification	Range
Operating temperature	0 .. 50°C
Input Power Supply	+24 Vdc \pm 10%
Output valve	0...250mAdc
Max. power consumption (only sensor 100 Ω)	1W
Max. power consumption (only sensor 100 Ω + valve fully open)	6.5W
Max. power consumption (only sensor 100 Ω + valve fully open + output pin2 20mA + output pin5 20mA + output actuator 20mA)	7.85W

4.5.7 Operation of PID controller module

Upon connection of the power and signal cables, the PID controller module is ready to control the temperature/flow and pressure of the system. The full scale sensor signal corresponds with 0 to 5 V I/O signal (4 to 20 mA for current I/O).

For operation of the user interface, refer to section [User interface](#).



5 Troubleshooting

Symptom	Action
Display is not lit after 'power on'	<ul style="list-style-type: none"> • check power supply • check fuse
No reading/control	<ul style="list-style-type: none"> • check instrument cabling • check if instrument is powered-up • for FLOW-BUS systems check node number • for FLOW-BUS systems check cables / termination
Wrong reading format	<ul style="list-style-type: none"> • check module settings ("settings/readout" menu)
Instrument seems to give inaccurate values	<ul style="list-style-type: none"> • check if correct fluid set (with calibration factors) has been selected (see "settings/readout/fluidset") • check if correct instrument is selected by the FLOW-BUS
Setpoint is ignored	<ul style="list-style-type: none"> • for meters setpoint facilities are disabled. • setpoint source in menu "settings/controller/mode" menu should be "bus/rs232". (other settings means different behavior) • setpoint could have been overruled by an alarm situation or counter limit (first perform reset) • setpoint slope has a large value. (setpoint will slowly change in time) Change slope value if necessary • setpoint could be changed by other devices connected to the FLOW-BUS • setpoint could be controlled by a master/slave instrument configuration • check communication with FLOW-BUS (if applicable) • Fail Safe State. For PROFIBUS/DeviceNet™/EtherCAT® instruments without bus communication set the setpoint control mode on RS232
Counter/alarm is not responding to reset	<ul style="list-style-type: none"> • check if reset-source has been enabled in the "security" menu
Display shows "no connection"	<ul style="list-style-type: none"> • check if the operating instrument is active • check if the operating instrument is still at the same node address • check instrument and module cabling • check the node address at "instrument" in the main menu
Parameter not available	<ul style="list-style-type: none"> • parameter is not supported by the connected instrument
Parameter or menu not accessible	<ul style="list-style-type: none"> • menu or parameter blocked by security mode
Settings menu not accessible or not present	<ul style="list-style-type: none"> • menu blocked by security mode • still in edit or alarm mode in main menu
Other problems	<ul style="list-style-type: none"> • check instrument and operating module parameters



Before switching on power, check if all connections have been made according to the hook-up diagram. The hook-up diagrams are available at the download section of our website: www.bronkhorst.com/downloads.



LED indications can be very useful in case of problems with the instrument. See the "MANUAL INTERFACE: micro-switch and LED's" section in the manual "Operation instructions digital instruments (document nr. 9.17.023)". This manual is available at the download section of our website: www.bronkhorst.com/downloads.

6 Removal and return instructions

6.1 Returns

In case the product needs to be returned (e.g. for calibration, repair), please refer to our website for information on the online product return process (RMA).

- Visit the Bronkhorst website.
- Go to the *Service & Support* section.
- Follow the on-screen instructions to return the product.

6.2 Disposal (end of lifetime)

If you are a customer within the European Union and wish to dispose of Bronkhorst® equipment bearing the symbol of a crossed out waste disposal bin, you can return it in accordance with the [removal and return instructions](#). Bronkhorst will then take care of proper dismantling, recycling and/or reuse (wherever possible). In the covering letter, mention that you are returning the product for disposal.

In countries outside the EU, disposal of electrical and electronic equipment (EEE) may be subject to local or national directives and/or legislation. If applicable, consult local or national authorities to learn how to handle EEE properly in your area.



7 Service

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

 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

For after-sales questions, help and guidance, our Customer Care department is available by e-mail:

 aftersales@bronkhorst.com

No matter the time zone, our experts within the Customer Care department are available to answer your request immediately or take 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



Service



Contact



Downloads



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

+31 573 45 88 00
info@bronkhorst.com
www.bronkhorst.com