flow technology by **vögtlin**

vögtlin
instruments

red-y smart series operating instructions

vögtlin
www.voegtlin.com
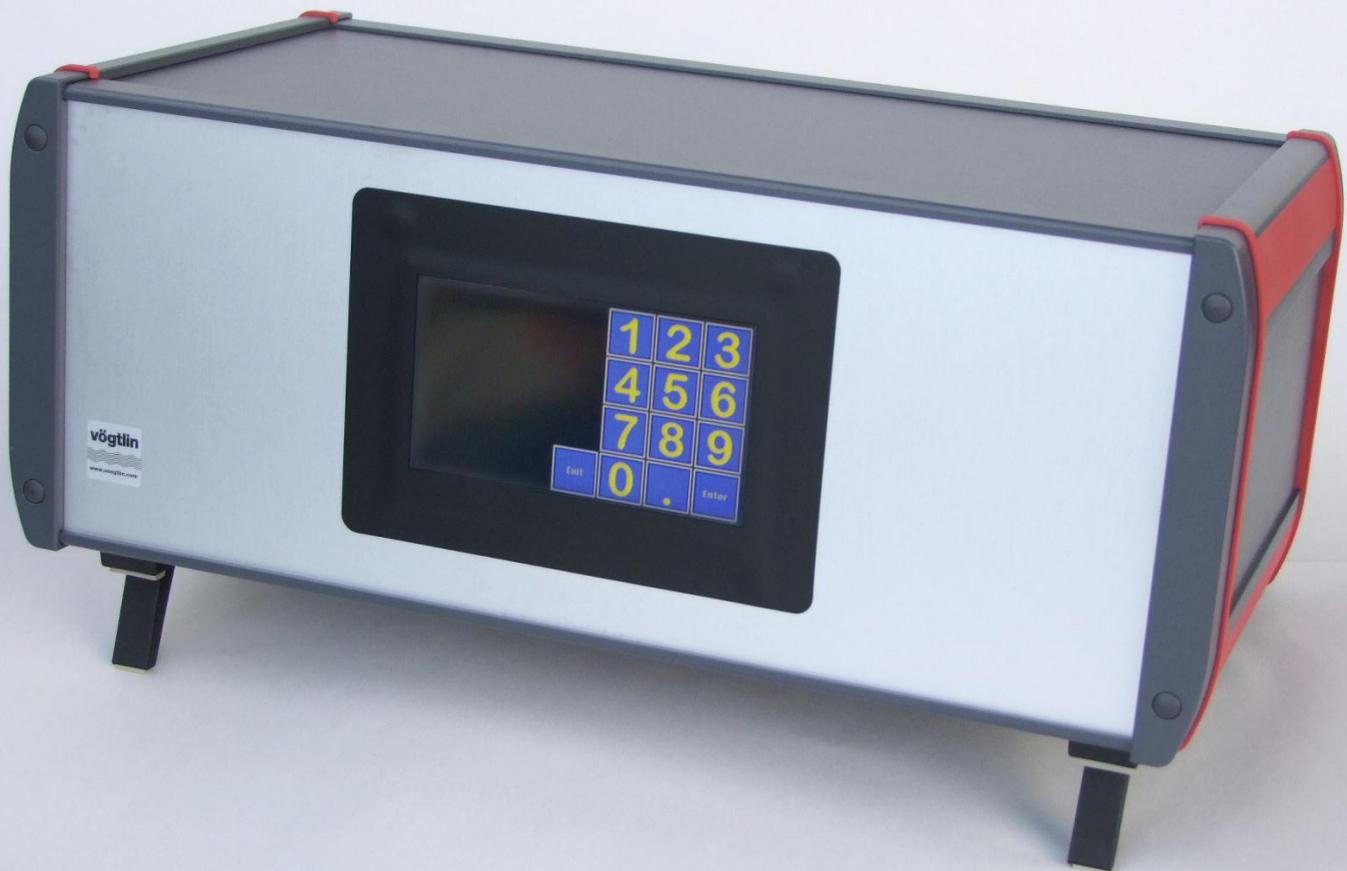
PCU-10 Display and Controll Unit
for *red-y smart series*

vögtlin
instruments

Operating instructions PCU-10
for *red-y smart series*

General operating instructions

red-y smart meter GSM
red-y smart controller GSC

These instructions are only valid for smart devices from serial number 110 000 and above

$C\epsilon$

Version: PCU-10_E2_1

For the latest information on our products, see our website at **www.voegtlin.com**

© 2011 Vögtlin Instruments AG, Switzerland

1.1 Important Instructions

Before and installing and operating the instrument it is strongly recommended that this operation manual should be read carefully. Not following the guidelines could result in personal injury and damage of equipment.

The content of this manual is provided for information only and may be altered without prior notice. Voegtlin Instruments AG assumes no responsibility or liability for any errors or inaccuracies in this manual.

⚠️ This symbol alerts the user to important operating, maintenance and service information.

Installation

Prior to commissioning please note the following

⚠️
- Only the supply voltage indicated on the nameplate is permissible
- This device must be grounded.
- The power supply is 100…240 VAC / at a maximum of 1.3A
- If a PDM-U cable is being used, do not connect an additional 24 volt power supply.

Products mentioned in these instructions can contain metal or elastomer gaskets, O rings or valve intakes. It is the user's own responsibility to select only such materials that are compatible with the process and the process conditions. The use of non-compatible materials can cause leaks in the gaskets of devices which could permit gases to escape from the device – which in turn can lead to health hazards and death.

We recommend checking the smart devices at regular intervals to ensure that leakage has not occurred. The metal or elastomer gaskets, O rings and valve intakes change with age and thus release gases due to leakiness.

Important instructions

⚠️
- Do not remove the cover - it prevents damage to the system. In case of a damaged hologram seal the warranty expires.
- There are no serviceable parts under the cover
- Repairs must only be performed by qualified personnel

Toxic, flammable gases and ATEX

In the case of toxic and flammable gases, the safety guidelines of the respective country must be followed. The red-y devices are not approved for use in Ex- zones. In the case of flammable and toxic gases, fittings and pipes intended for that purpose must be used. The responsibility for safe operation lies with the designer of the facilities. The devices must not be used in areas containing explosive mixtures.

Removing a device

Before removing a smart device from installation the power supply of the measuring instrument must be switched off.

Troubleshooting

Problems with the system usually have manifold causes. Therefore Vögtlin recommends consulting both the operating instructions of the original equipment manufacturer as well as our operating instructions before removing the measuring instrument from the system.
Please read also chapter "Troubleshooting" in the general operation manual mass flow meter and controller, part 1.

$\mathsf{C}\mathsf{E}$

The equipment fulfills the regulations according to CE.

Recycling

Please observe the applicable regulations of your country.

Subject to change

Due to our policy of ongoing product development, we reserve the right to change the information in this manual without notice. All rights reserved. No part of this publication may be reproduced in any form or by any means without the publisher's prior written permission

Contents

1 Introduction

1.1 Purpose of the Operating Instructions

Working with gases, in particular with flammable and/or toxic gases, requires maximum caution. Therefore reading and understanding these operating instructions prior to the installation and commissioning of the PCU-10 is imperative, so that errors in operation can be excluded.

The operating instructions should always be available to operating personnel. Following the operating instructions helps avoid risks, minimizes downtime caused by operating errors and ensures the service life and reliability of the PCU-10.

The complete operating instructions should be read carefully prior to installation and commissioning.

If unexpected malfunctions occur which cannot be remedied even with the help of the operating instructions, please contact us specifying the device number (see technical data) or fax us the technical data sheet of these operating instructions with a brief description of the error. Please remember to list your name, the name of your company and your telephone number.

⚠️ In the event of modifications to the PCU-10 these operating instructions lose their validity!

2 Commissioning

2.1 Initial Inspection

The PCU-10 comes programmed and ready for connection. Prior to setup and installation you should check the delivery for shipping damages. If damages have occurred, do not operate the PCU-10. Inform customer service or the manufacturer immediately. The PCU-10 is to be transported using the appropriate means and should be protected from tipping or water damage. Be sure to set it up on a level surface.

2.2 Important Instructions for supplying gas

The respective gases may only be supplied to the gas mixture and regulation system via the appropriately designated gas connections. The system itself must be tested for leaks.

On the gas supply side of the system make certain that the maximum permissible supply pressure is not exceeded.

Only then should you operate a gas mixture and regulation system with the PCU-10.

2.3 Connecting the System

External electrical connections, if required, should only be performed by professionals.

Warning:
The length of the cable provided by the factory may only be altered upon consultation!

---

1. Use the supplied connector plug to connect the device to an appropriate socket with grounding contact 230V / 50 Hz.

2. A sufficiently sized power supply is built in the device for operation of the devices (230V AC / +24 V DC).

3. Use the ON/OFF switch on the rear to switch the device on.

3 Main screen

After you switch on the device the version number of the software installed on the micro-controller is briefly displayed on the screen. In case of malfunction, please mention this number.

After that the main screen typical for the set operating mode (Op Mode) appears. The currently selectable operating modes are the normal GSM/GSC controller under the name „MFC-Control", a master-slave mixer controller under the name „Master-Slave", a general gas mixer controller under the name „Mixer" as well as a special burner controller under the name of „Burner".

In addition, an „offline" function is also available. If the device is switched to offline mode, it continues to supply the connected MFC and GPC with power, but no longer communicates with the connected devices.

For example, this makes it possible for a PC to control the connected MFC and GPC via a PDM-U cable. A separate connector is present on the rear of the device for connection of the PDM-U cable. The PDM-U cable in this case is supplied with power from the PCU-10 ***and there must be no power supply connected to the round connector of the PDM-U cable.***

All the different main screens have the following in common: in the bottom right corner a „Menu" button is displayed with which you can carry out the basic functions important for the respective operating mode (if present). You can also use this button to change operating modes.

3.1 Main Screen Offline

The main screen of offline mode displays the following text in the middle of the screen „Offline, MFCs may be handled from other bus controllers".

Apart from that you will only see the „Menu" button in the lower right corner.

**Offline, MFCs may be handled
from other bus controllers**

Menü

The menu, which opens when you select the button, only allows you to set the brightness of the display (Brightness) and change operating modes (Op Mode).

Exit

Op Mode: MFC Control [1]
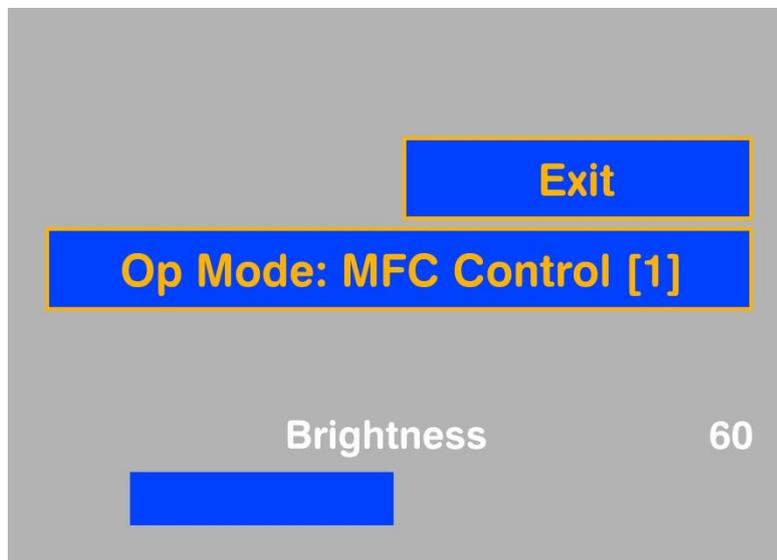
Brightness   60

3.1.1 Op Mode

Basic operating mode of the controller

> 0 = Offline
> 1 = MFC-Control
> 2 = Master-Slave mixer
> 3 = General Gas mixer
> 4 = Burner controller

3.1.2 Brightness

Sets the brightness of the display.

3.1.3 EXIT

When you exit this window you return to the main screen

3.2 Main screen for MFC-Control

In addition to the menu button there are other buttons whose captions give you information about the set operating mode.[1] For example, if you see one or more buttons labeled with „A" and a number, as shown below, you are in „MFC-Control" operating mode. This operating mode allows users to set each of the connected devices to a setpoint or to read its actual values without having the individual devices be in a specific logical relationship to one another.

A1

Menü
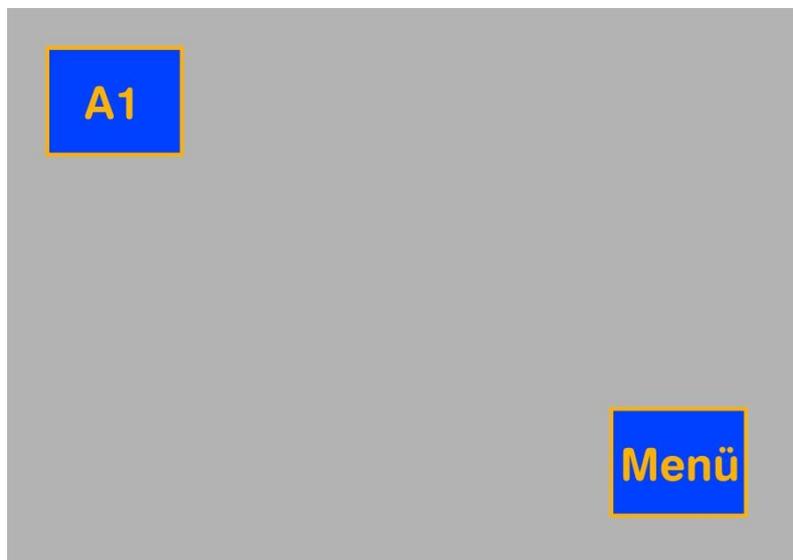
In the „MFC-Control" operating mode each button stands for a single registered MFC (Mass Flow Controller), MFM (Mass Flow Measurement) or GPC (Gas Pressure Controller). The number after the „A" is identical to the address of the MFC, MFM or GPC. Each connected device must have a unique address in the system via which it can be addressed by the PCU-10. The micro-controller

---

[1] If you do not see any other buttons, it means no MFCs are „registered" on the device. In this case read the section „Registering new MFCs"

ensures that these addresses start with „1" and are sorted in continuous ascending order. You can find more information about this in the section „Registering new MFCs".

When you press one of the buttons the operating parameters for the MFC with this address are displayed. Here is an example of what that looks like:
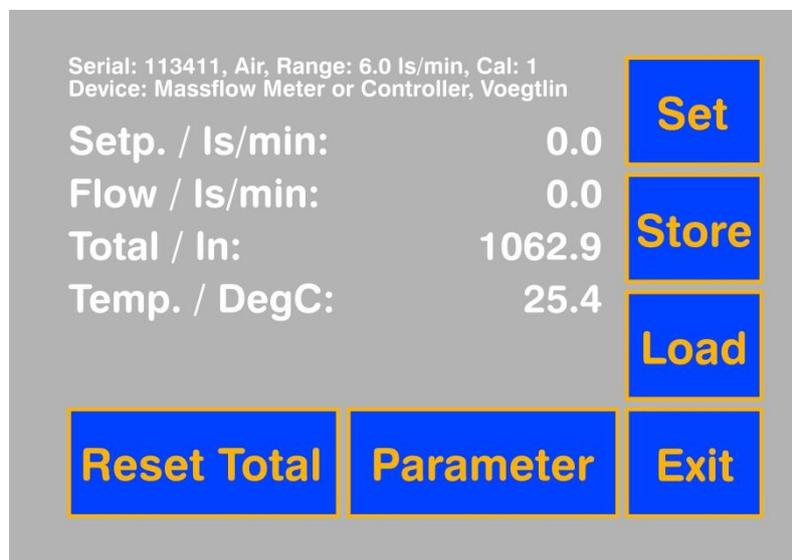
The following are displayed:

- **Serial number**
- **Gas type**
- **Flow range**
- **Calibrating plot**
- **Type of connected device**
- **Manufacturer of connected device**

as well as somewhat larger:

- **Setpoint (with MFC/MFM for the flow, with pressure regulators for the pressure)**
- **Actual value (with MFC/MFM for the flow, with pressure regulators for the pressure)**
- **Counter (Total)**
- **Temperature**
- **Flow at actual value (for a pressure regulator)**

The control elements in this window are:

3.2.1 SET

Sets the setpoint when a flow controller or pressure regulator are connected. In case of operation with a flowmeter, the setpoint setting has no function! To enter a setpoint, press the *SET* button – a field with numbers 0-9 opens with which you can enter the setpoint. Press the *Enter* button to accept the setpoint and have it automatically saved. The setpoint is then displayed on screen and the displayed actual value should match the setpoint. Only setpoints in the measuring range of the connected device (flow and pressure) can be specified. The program will not accept values exceeding the measuring range.

3.2.2 STORE

Storage function for setpoints (max. 12) – the **Store** setting has no function in the case of operation with a flowmeter. To save a setpoint, press the **Store** button – a window opens with the buttons „M1" through „M12". „M" stands for memory, that is, memory location. Pressing one of these buttons saves the **currently set** setpoint in memory locations 1-12. The „Exit" button allows you to return to the previous screen without saving.

3.2.3 LOAD

Loads stored setpoints, thus the counterpart to Store. Setpoints which have been saved via the **Store** function can be loaded again from this menu. Here again the „Exit" button lets you return to the previous screen without performing a load.

3.2.4 EXIT

When you exit this window you return to the main screen

3.2.5 RESET TOTAL

Resets the counter/totalizer, which can be found directly on the flowmeter / regulator (real value). When you select this and any other function which represents a permanent intervention in the system an „Are you sure? " prompt appears. You must answer with „Yes" to have the action carried out.

3.2.6 PARAMETER

Menu for setting user parameters – WARNING: Settings should only be made by trained personnel!

Min Flow	0.0	Exit
Max Flow	100.0	More
Min Press		
Max Press		
Cal	2	
Device	Massflow [1]	
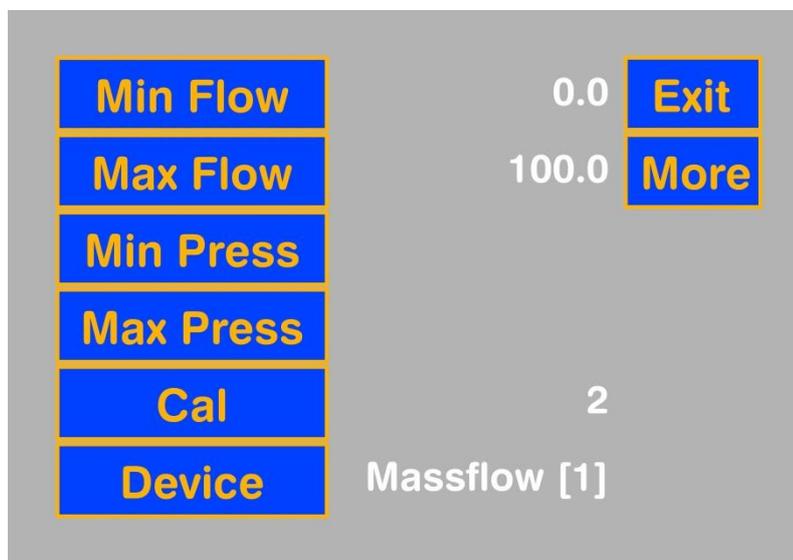
Alarm min. Flow / Alarm max. Flow

Depending on the design of the device the actual value of the flow in the event of exceeding or falling below the set limits appears in RED (or if a 24 volt circuit module is connected a switching contact is switched)

Alarm min. Press / Alarm max. Press

Depending on the design of the device the actual value of the pressure in the event of exceeding or falling below the set limits appears in RED (or if a 24 volt circuit module is connected a switching contact is switched)

CAL

Menu for selection of the factory calibrating plots stored on the device. Selecting the calibrating plot changes the display of the gas type, range and the calibrating plot in the main menu. ***Warning:*** possibly set alarm limits must be adapted.

Device

The default setting is „1" for MFCs and MFMs. In case of a VÖGTLIN pressure regulator the following settings are possible:

- **1 = Operation of the pressure regulator as a normal MFC/MFM**
- **2 = Operation of the pressure regulator as an initial pressure regulator**
- **3 = Operation of the pressure regulator as a post pressure regulator**

MFC, MFM and pressure regulators can be randomly combined with one another in a system. One special feature of the PCU-10 is that, in addition to VÖGTLIN devices it also supports digital MFC from BRONKHORST, which likewise can be randomly combined with other devices. The BRONHORST devices must be equipped with the „MODBUS" option.

More

Another menu opens here which shows some properties that are of importance for the general gas mixer function. If you do not use the gas mixer function these parameters are irrelevant.

Conc In	100.0	Exit
Units	Vol %	
Controlled	No	
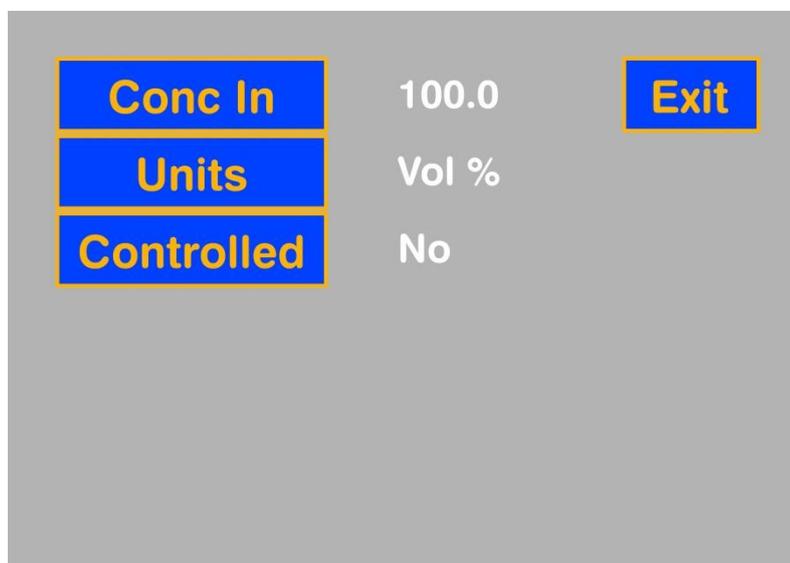
The parameters in this menu have the following meanings:

Conc In

Gas mixers do not always work with pure gases, under certain circumstances they also work with pre-rarefied gases. Therefore, it is important for the gas mixer function to „know" the initial concentration of a gas. For pure gases please enter „100" and for „Units" „Vol%". Otherwise enter the

amount in Vol% of total gas. If you are working with a high pre-rarefication, the amount can also be specified in ppm instead of in Vol %.

Units

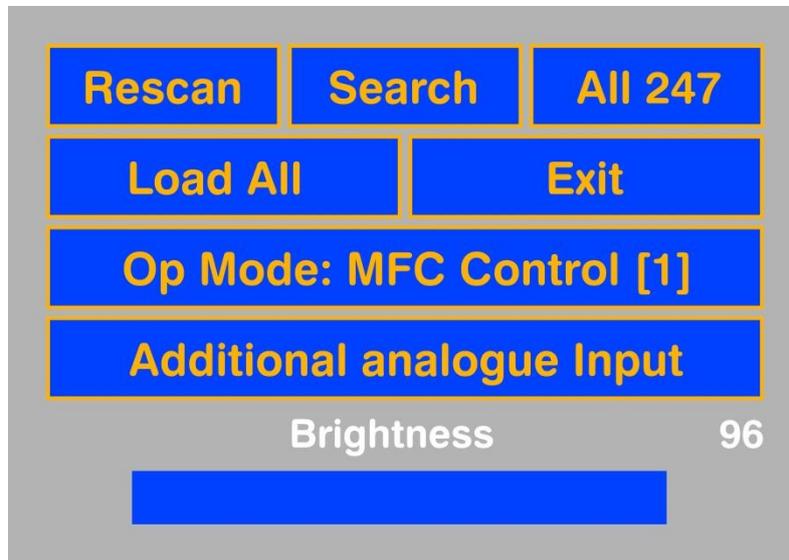Selects Vol % or ppm as the unit for this gas.

Controlled

For gas mixers which consist of N different channels, the concentrations for N-1 channels are freely adjustable. One channel (usually called „control gas") however must be freely adjustable by the mixer so that it can achieve the desired concentrations in the case of simultaneous specification of a total volume flow rate.

By choosing „Yes" for „Controlled" you are indicating that it is ***this*** MFC which is to be freely adjustable. Please keep in mind that for one gas mixer exactly one of the 2 to 4 possible channels must be designated as „Controlled". Otherwise you will get an error message.

3.2.7 Menu display for MFC-Control

When you choose the Menu button in the MFC-Control operating mode the following screen displays:

```
┌─────────────────────────────────────────┐
│   Rescan    │   Search    │   All 247    │
│─────────────────────────────────────────│
│      Load All      │        Exit         │
│─────────────────────────────────────────│
│        Op Mode: MFC Control [1]          │
│─────────────────────────────────────────│
│        Additional analogue Input         │
│                                          │
│            Brightness            96       │
│        ┌─────────────────────────┐       │
│        └─────────────────────────┘       │
└─────────────────────────────────────────┘
```

The buttons have the following meanings:

Rescan

Tests whether all registered devices are really connected and deletes devices that are not present from the main screen.

Search

If several devices with different addresses are connected, they are provided with addresses with the numbers 1 and above in ascending order and then displayed by the controller on the main screen.

All 247

All connected devices will be reset to the default address 247 (factory setting).

Load All

The setpoint from memory locations 1 – 12 can be simultaneously loaded for all connected devices.

OP Mode

Basic operating mode of the controller

0 = Offline
1 = MFC-Control
2 = Master-Slave mixer
3 = General Gas mixer
4 = Burner controller

Additional analogue Input

The control board of the PCU-10 has an A/D converter, with which the currents in the range 0/4- 20 mA with high resolution (22 bit) can be measured.

In the "MFC-Control" operating mode any parameter can be measured and also displayed. In the operating mode "gas mixer" the total flow can be made dependent on the measured values of this input so that O2 controlled mixers and pressure-controlled mixers can be realized.

The properties of this input are set here.

Active	1	Exit
Name	Pressure	
Units	Bar	Cal
Format	%.1f	
Low	0.0	
High	10.0	
Filter	5	

Active

„1" means switched on and „0" means switched off.

Name

The name to be used for the measured value. A complete alpha-numeric keyboard is available for input which allows you to switch back and forth between Upper Case/Lower Case and Special Characters.
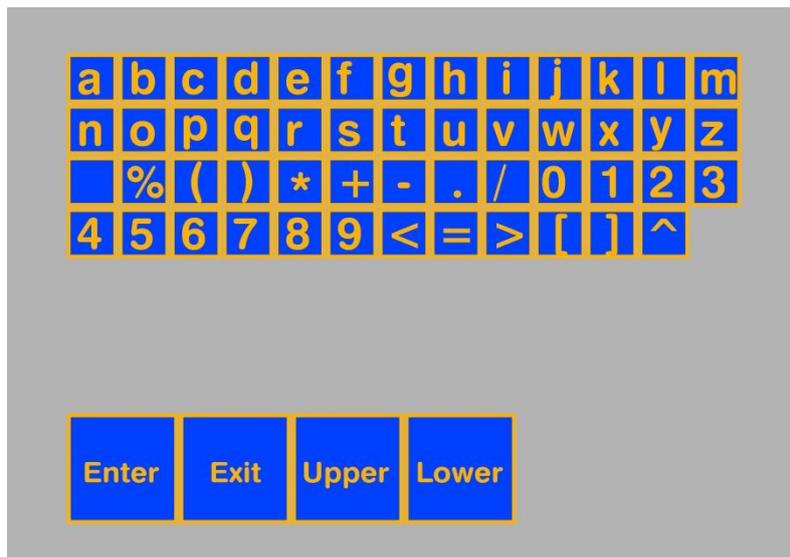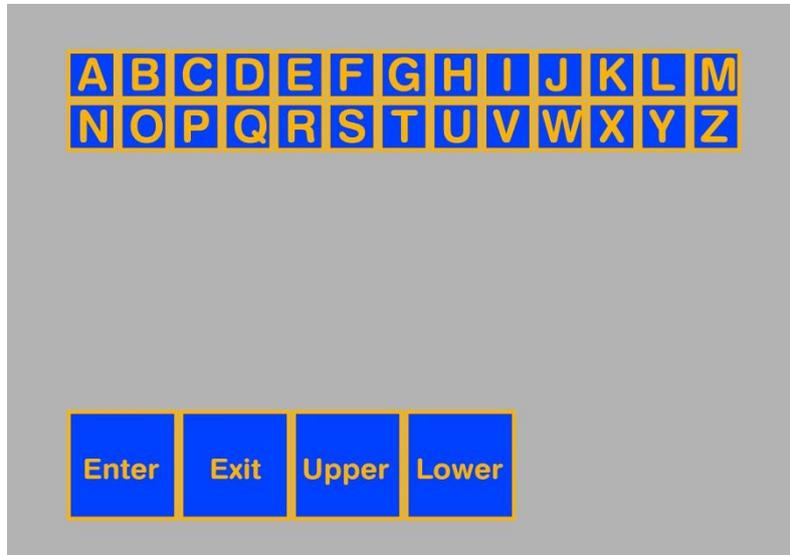
Units

The unit for the measured value, is also set using the keyboard shown above.

Format

The number format with which the measured value is displayed. The format string is borrowed from the programming language C.

Low

This is the measured value which belongs to the lower calibration value.
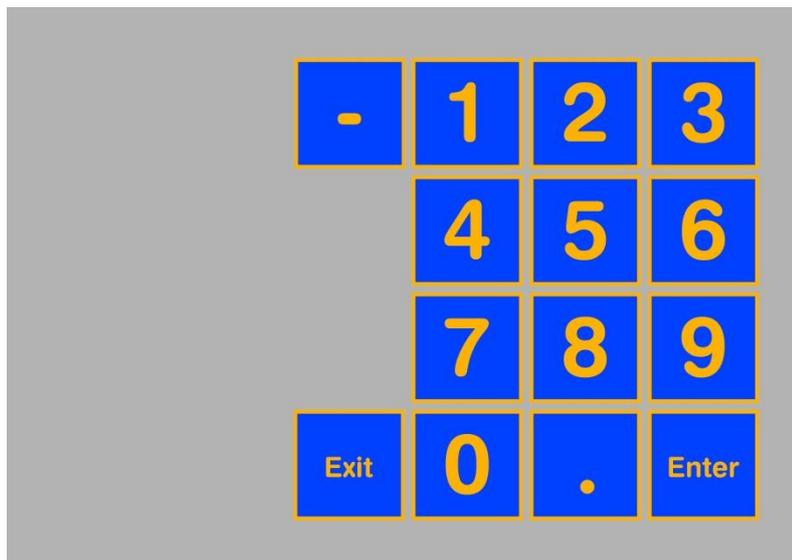
High

This is the measured value which belongs to the upper calibration value.

Filter

This is the value of a low-pass filter generated by software and indicates the T66 time in seconds.

Cal

Calibration of the input. Since this is an operation which should not be carried out by mistake, a numeric password must first be entered on a numeric keypad.

The password is „314159", these are the first 6 digits of the Archimedes' constant, Pi and are therefore easy to remember.

Conclude your input by pressing „Enter".

A window opens in which you can then calibrate the input.
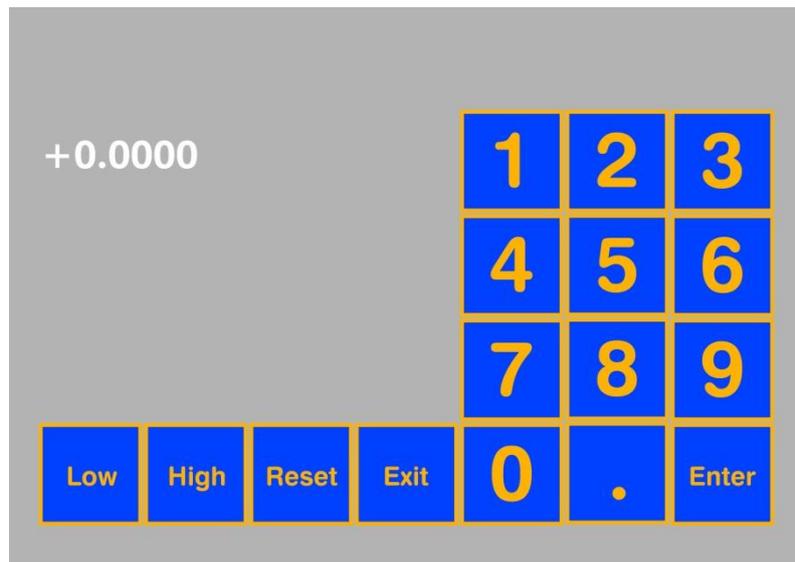
Here are the settings

Low

Accept the current value of the A/D converter displayed in the upper left corner as the low calibration value.

High

Accept the currently displayed value of the A/D converter as the high calibration value.

Reset

Resets the low and high calibration values to the default settings. These are „0.4" corresponding to 4 mA input current and „2.0" corresponding to 20 mA input current.

Exit

Exits the menu

Brightness

Sets the brightness of the display.

Exit

Exits the menu

3.3 Main screen for Master-Slave

The ‚Master-Slave" operating mode combines two devices with sequential addresses into a so-called Master-Slave mixer. Here, the odd addresses are equipped with MFMs and the even addresses are equipped with MFCs. It is the task of the Master-Slave mixer to measure the flow of the MFM and to adjust the flow of the MFC in such a way that the mixing ratio remains constant regardless of the quantity that has been discharged.

Since, as a result of the fact that MFM and MFC have differing measuring ranges, the mixing ratio can have a very great dynamic range, in the case of the Master-Slave mixer it is possible to specify the mixing ratio both in the unit % as well as in the unit ppm.

You can recognize the main screen of this operating mode by the fact that each *Pair* of this type is labeled with the letters „MS" as well as with an ascending number starting with „1".
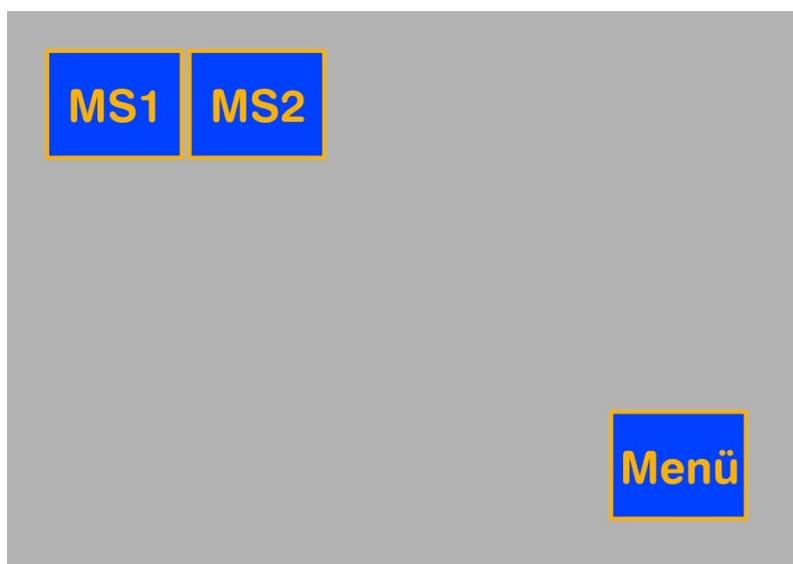
When you press one of these buttons the display changes to
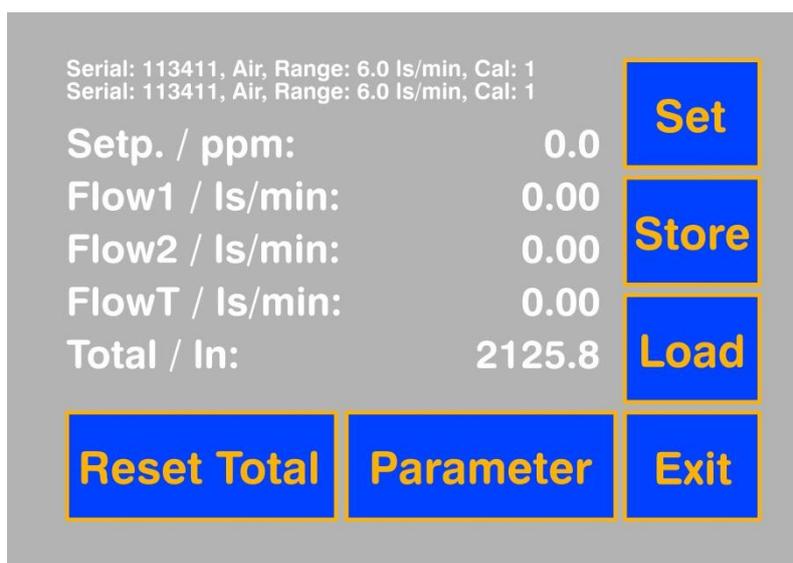
The following are displayed:

- **Serial number of MFM and MFC**
- **Gas type of MFM and MFC**
- **Flow range of MFM and MFC**
- **Calibrating plot of MFM and MFC**

as well as somewhat larger:

- **Setpoint of the mixing ratio**
- **Actual value for MFM and MFC**
- **Total volume flow rate of MFM and MFC**
- **Total calculated from the individual totals of MFM and MFC**

The control elements in this window are:

3.3.1 SET

Sets the setpoint for the mixing ratio. To enter a setpoint, press the ***SET*** button – a field with numbers 0-9 opens with which you can enter the setpoint. Please keep in mind that there is no Enter button here. Instead, you will see a „%" button and a „ppm" button. You conclude your input with one of these unit buttons. After you have pressed the units button the setpoint with the unit is accepted and automatically saved.

3.3.2 STORE

Storage function for setpoints (max. 12). To save a setpoint for the mixing ratio, press the ***Store*** button – a window opens with buttons „M1" through „M12". „M" stands for memory, that is, memory location. Press one of the buttons to store the ***currently set setpoint*** (of the mixing ratio!) in memory locations 1-12. The „Exit" button allows you to return to the previous screen without saving.

3.3.3 LOAD

Loads stored setpoints, thus the counterpart to Store. Setpoints which have been saved via the ***Store*** function can be loaded again from this menu.
Here again the „Exit" button lets you return to the previous screen without performing a load.**EXIT**

When you exit this window you return to the main screen

3.3.5 RESET TOTAL

Resets the counter/totalizer, which is located directly on the flowmeter and the regulator (real value). When you select this and any other function which represents a permanent intervention in the system an „Are you sure? " prompt appears. You must answer with „Yes" to have the action carried out.

3.3.6 PARAMETER

Menu for setting user parameters – WARNING: Settings should only be made by trained personnel!

Min Flow 1

The actual value of flow 1 appears in RED if it falls below the set limits (or if a 24 volt circuit module is connected a switching contact is switched)

Max Flow 1

The actual value of flow 1 appears in ROT if it exceeds the set limits (or if a 24 volt circuit module is connected a switching contact is switched)

Min Flow 2

The actual value of flow 2 appears in RED if it falls below the set limits (or if a 24 volt circuit module is connected a switching contact is switched)

Max Flow 2

The actual value of flow 2 appears in ROT if it exceeds the set limits (or if a 24 volt circuit module is connected a switching contact is switched)

Menu display for Master-Slave

The menu in the Master-Slave operating mode looks like this:

The buttons have the following meanings:

Load All

For all mixers, the setpoint of the mixing ratio can be loaded simultaneously from memory locations 1 - 12.

OP Mode

Basic operating mode of the controller

     0 = Offline
     1 = MFC-Control
     2 = Master-Slave mixer
     3 = General Gas mixer
     4 = Burner controller

Brightness

Sets the brightness of the display.

Exit

Exits the menu

3.4 Main screen of the Mixer function

The Mixer function implements a general gas mixer function, in which case two to four MFCs are combined into one mixer.

| Gas in ln / Min	Setpoint	PV
N2	0.0	0.0
CO	0.0	0.0
O2	0.0	0.0
Ar	0.0	0.0
Total	0.0	0.0
Pressur / Bar	-0.0	**Para** **Menü**

The names of the gases (automatically read out from the MFCs) appear underneath the column headings as well as the setpoints and PVs (process value) for the 2-4 MFCs, which form the mixer.

Currently three mixer types are implemented:

- Mixer with fixed adjustable total volume flow rate and adjustable concentrations

- Mixer with adjustable concentrations but total volume flow rate automatically resulting from a measured O2 concentration

- Mixer with adjustable concentrations but total volume flow rate automatically resulting in dependency on a measured pressure in a buffer container

The first type is intended for general gas mixer functions, while the second is predominantly used in the packaging industry (keyword MAP) and the third type is used when there is a timed withdrawal of mixed gas from a storage tank.

3.4.1 Parameter Window of the Mixer function

N2/Vol%	30.0	Exit
CO2/Vol%	Controlled	More
O2/Vol%	50.0	On
Ar/Vol%	0.0	Off
Reset All		
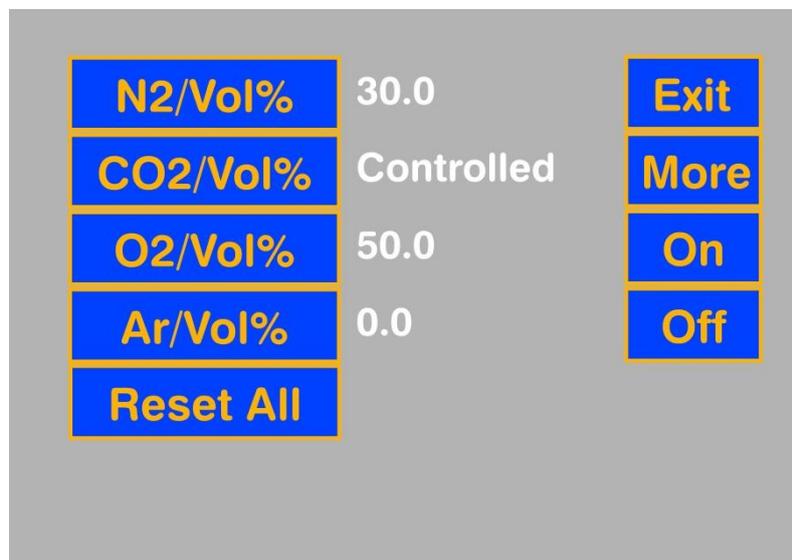
When the gas mixer function is selected, the first 2 - 4 registered MFCs (see: Registration of MFCs) are combined into one mixer.

The upper 2-4 buttons on the left side of the window display the gas names that have been read out of the MFCs. The units result from the MFC configuration in accordance with 3.2.6.5.

For those MFCs not designated as „Controlled" it is possible to enter the concentration. The value of the MFC designated as „Controlled" automatically results from the marginal conditions.

Reset All
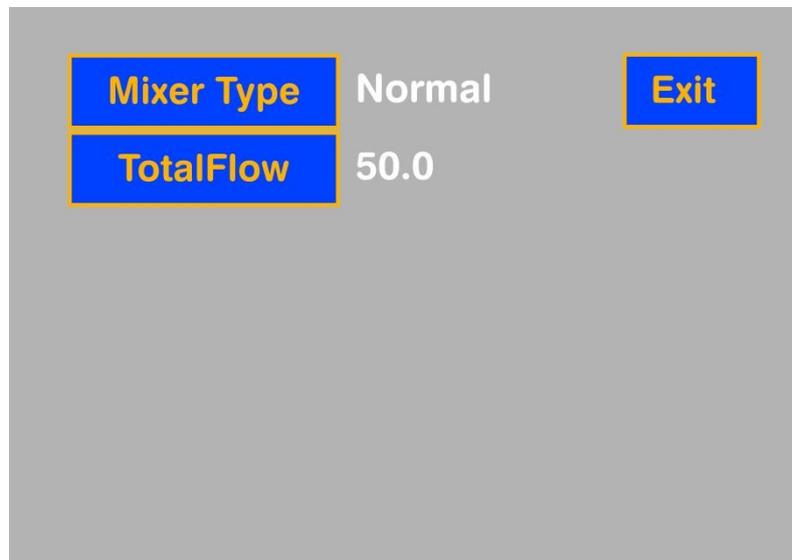The values of all adjustable concentrations are set to „0"

On
The mixer is switched on, the currently actual volume flow rate is flowing.

Off
The mixer is switched off, no gas is flowing

More

A second window for the parameterization of the Mixer function opens.

Mixer Type	Normal
TotalFlow	50.0

Exit

Mixer Type

Here you can select which of the three mixer types is activated. The numbers mean the following

- **1 = Standard Mixer function**
- **2 = O2-controlled Mixer**
- **3 = Pressure Controlled Mixer**

The window has a different appearance depending upon which mixer type is selected. In the case of the Standard Mixer function you can only set the Total volume flow rate as second parameter, as shown above.

Total Flow

The Total volume flow rate for the Standard Mixer function in l/Min

Exit

Exits the menu

If an O2-controlled mixer is selected, the window will look like the one shown below.

Mixer Type	O2		Exit
Min TotalFlow	50.0		
Max TotalFlow	50.0		
Pos Slope	2.0		
Neg Slope	0.2		
O2 Limit	1.0		

Here are the settings

Mixer Type
Here you can select which of the three mixer types is activated. The numbers mean the following

- **1 = Standard Mixer function**
- **2 = O2-controlled Mixer**
- **3 = Pressure Controlled Mixer**

Min Total Flow
The total volume flow rate of the mixer in l/Min, which under no circumstances will be fallen short of.

Max Total Flow
The total volume flow rate of the mixer in l/Min, which under no circumstances will be exceeded.

Pos Slope
If the O2-limit measured value is exceeded, the total volume flow rate will be increased every second by the value specified here, until the condition is no longer given.

Neg Slope

If the O2-limit measured value is fallen short of, the total volume flow rate will be decreased every second by the value specified here, until the condition is no longer given.

O2-Limit

Limit of the O2-measurement

If a Pressure Controlled Mixer is activated, the second parameter window will have the following appearance:

Mixer Type	Pressure	Exit
Min TotalFlow	50.0	
Max TotalFlow	50.0	
Pressure Low	2.0	
Pressure Hi	3.0	

Here are the settings

Mixer Type

Here you can select which of the three mixer types is activated. The numbers mean the following

- **1 = Standard Mixer function**
- **2 = O2-controlled Mixer**
- **3 = Pressure Controlled Mixer**

Min Total Flow

The total volume flow rate of the mixer in l/Min, which under no circumstances will be fallen short of.

Max Total Flow

The total volume flow rate of the mixer in l/Min, which under no circumstances will be exceeded.

Pressure Low

This is the lower value of the pressure hysteresis. When this value is fallen short of, it results in the mixture generation being switched on with the total volume flow rate Max Total Flow.

Pressure High

This is the upper value of the pressure hysteresis. When this value is exceeded, it results in the mixture generation being switched off. The total volume flow rate has at this time reached the value Min Total Flow.

Exit

Exits the menu

3.4.2 Error Messages of the Mixing Function

The mixing function automatically monitors whether the user input for Total volume flow rate and the individual concentrations are compatible with the properties of the MFCs with regard to measuring range and dynamics.

If this is not the case, one of the error messages listed below will be displayed:

"Violation of MFC 1 minimum value"
"Violation of MFC 1 maximum value"
"Not enough flow free for MFC 1"
"Violation of MFC 2 minimum value"
"Violation of MFC 2 maximum value"
"Not enough flow free for MFC 2"
"Violation of MFC 3 minimum value"
"Violation of MFC 3 maximum value"
"Not enough flow free for MFC 3"
"Violation of MFC 4 minimum value"
 "Violation of MFC 4 maximum value"

"Not enough flow free for MFC 4"
"Violation of MFC 1 minimum value at lower total flow value"
"Violation of MFC 1 maximum value at lower total flow value"
"Not enough flow free for MFC 1 at lower total flow value"
"Violation of MFC 2 minimum value at lower total flow value"
"Violation of MFC 2 maximum value at lower total flow value"
"Not enough flow free for MFC 2 at lower total flow value"
"Violation of MFC 3 minimum value at lower total flow value"
"Violation of MFC 3 maximum value at lower total flow value"
"Not enough flow free for MFC 3 at lower total flow value"
"Violation of MFC 4 minimum value at lower total flow value"
"Violation of MFC 4 maximum value at lower total flow value"
"Not enough flow free for MFC 4 at lower total flow value"
"Violation of MFC 1 minimum value at higher total flow value"
"Violation of MFC 1 maximum value at higher total flow value"

"Not enough flow free for MFC 1 at higher total flow value"
"Violation of MFC 2 minimum value at higher total flow value"
"Violation of MFC 2 maximum value at higher total flow value"
"Not enough flow free for MFC 2 at higher total flow value"
"Violation of MFC 3 minimum value at higher total flow value"
"Violation of MFC 3 maximum value at higher total flow value"
"Not enough flow free for MFC 3 at higher total flow value"
"Violation of MFC 4 minimum value at higher total flow value"
"Violation of MFC 4 maximum value at higher total flow value"
"Not enough flow free for MFC 4 at higher total flow value"

In such cases you will have to modify your operating parameters accordingly.
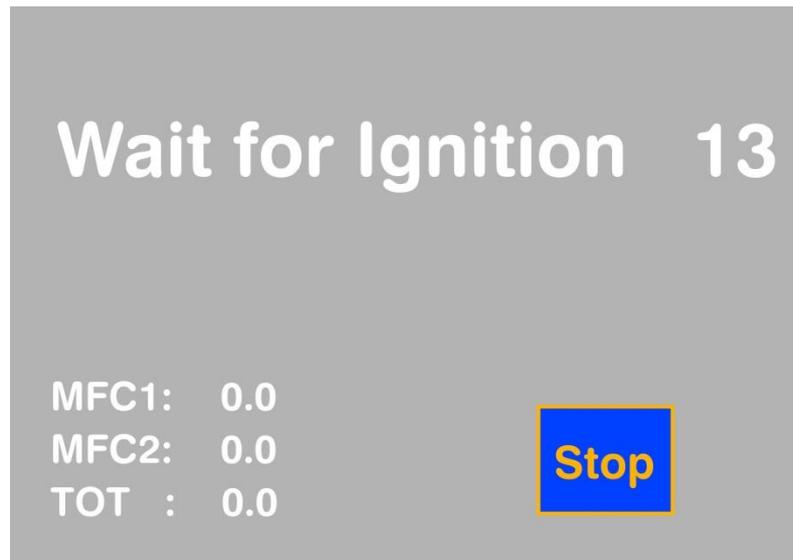
3.5 Main Screen of the Burner Controller

The Burner Controller is used for the controlled ignition of an oven and its monitoring after ignition. First both MFCs and both solenoid valves are closed. The actual values of both MFCs are displayed in the bottom left corner of the screen.

In the case of the Burner Controller a series connection of four zero potential contacts is monitored, consisting of two pressure monitors arranged upstream of the MFCs, one emergency off switch and a fourth contact supplied by a monitoring camera which detects a flame in the oven.

Please keep in mind that the series connection will only signal a „good state" when all the contacts are closed. Opening a single contact is sufficient to set the „bad state".

We will assume that both pressures are okay and that the emergency off switch has not been pressed. Then the good/bad state will only be set by the contact of the camera.

Wait for Ignition   13

MFC1:   0.0
MFC2:   0.0
TOT :   0.0

Stop

The big „Start Oven" button opens both solenoid valves and sets both MFCs to a specified set-point. ***This setpoint is the one which arises from the parameterization of the burner controller for the ignition.***

The resulting gas mixture is used to ignite the oven. In this phase the screen looks like the one shown above (in reality the MFCs display different numbers than „0"):

After the oven is started a seconds counter runs backwards from 16 to 0. If no flame has been detected during this time, the solenoid valves are closed, the setpoints of the MFCs are set to „0" and an error message appears on the screen which must be confirmed by the user before a new ignition can be initiated.

Reset Error

MFC1:   0.0
MFC2:   0.0
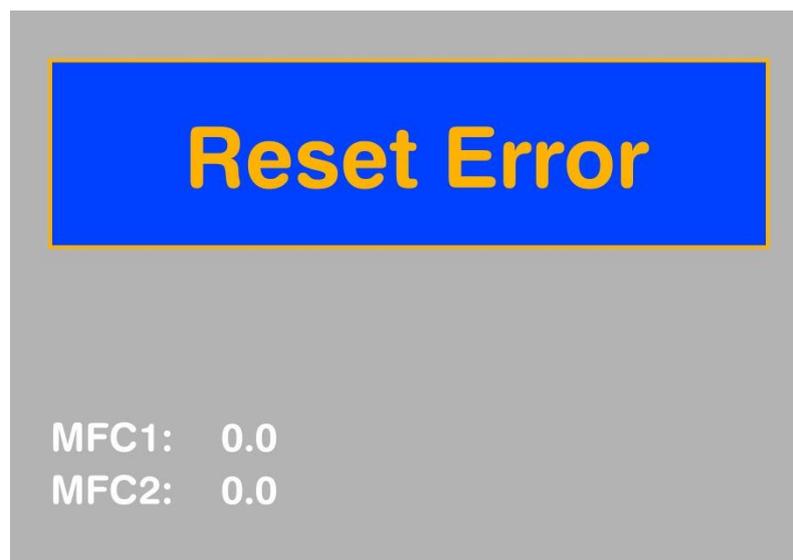
If the monitoring camera detected a flame within this time, the original mixing ratio remains constant, but the display changes to
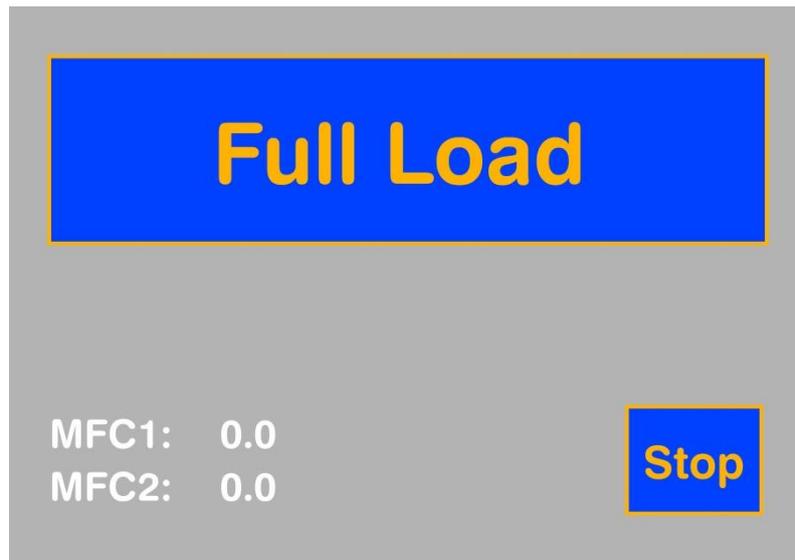
With this the Burner Controller is informing the user that everything is okay and that you can switch to the second gas mixture by pressing the button. ***The second gas mixture is the one which results from the parameterization of the burner controller for the full load range.*** After shifting to the second mixture the display changes to:

Now the oven can be switched off at any time by pressing the Stop button. It will likewise be imme-diately switched off if the system detects a bad condition.

Keep in mind that during the ignition phase of the system, that is, if „Full Load" is displayed, a bad condition is allowed to occur without resulting in the system being immediately switched off. If a bad condition occurs in this state, the „Waiting for Ignition" display appears and the timer will be restarted and run backwards. In this phase an abortion of the gasing is exclusively triggered by the expiration of the timer, which can be retriggered.

3.5.1 Parameters of the Burner Controller

Pressing the „Para" button takes you to the parameter settings of the Burner Controller.

MFC1 %Tot @ Ingition	5.0
Total flow @ Ingnition	50.0
MFC1 %Tot @ full Load	4.3
Total flow @ full Load	50.0
Store Nonvolatile	
Exit	

MFC % Tot @ Ignition

MFC1 is responsible for the fuel gas, MFC2 for the oxygen carrier. This setting defines how high the percentage of fuel gas in the total gas flow for the ignition flame is.

Total Flow @ Ignition

This setting defines how high the total gas flow is in l/Min for the ignition flame.

MFC % Tot @ full Load

This setting defines how high the percentage of combustible gas is in the total gas flow for a full load operation.

Total Flow @ full Load

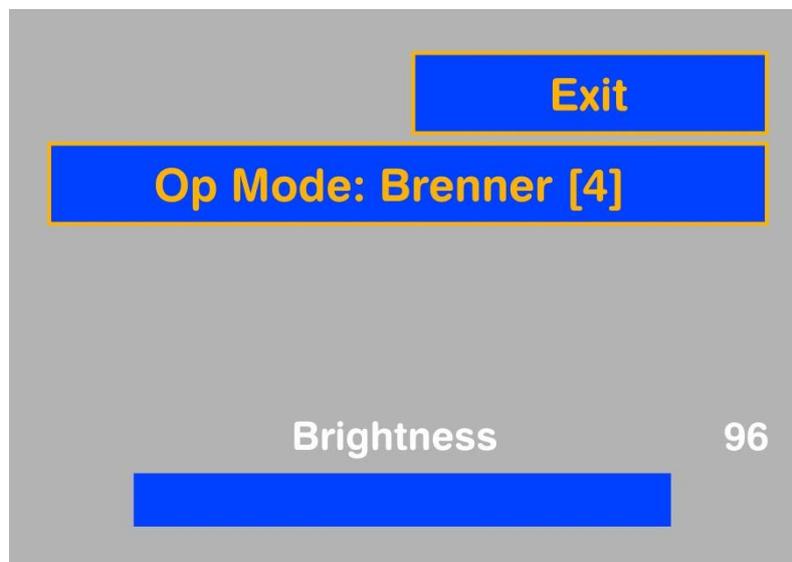This setting defines how great the total gas flow in l/Min for the full load operation.

Store Nonvolatile

When this button is pressed the visible settings are saved in non-volatile memory.

Exit

Exits the window

3.5.2 Menu Display of the Burner Controller

The menu of the Burner controller is shown in the figure above. The buttons have the following meanings:

OP Mode
Basic operating mode of the controller

> 0 = Offline
> 1 = MFC-Control
> 2 = Master-Slave mixer
> 3 = General Gas mixer
> 4 = Burner controller

Brightness
Sets the brightness of the display.

Exit
Exits the menu

Please keep in mind that the menu button of the Burner Controller is only visible in the idle state of the system, that is, when the oven has been switched off. This ensures that the operating mode cannot be changed when the oven is burning and thus the oven cannot achieve an undefined state.

3.5.3 Error Messages of the Burner Controller
The Burner Controller automatically monitors whether the user input for Total volume flow rate and the combustible gas percentage are compatible with the properties of the MFC with regard to measuring range and dynamics.

If this is not the case, one of the error messages listed below will be displayed:

"MFC1 setpoint < 3% range @ ignition"
"MFC1 setpoint > range @ ignition"
"MFC2 setpoint < 3% range @ ignition"
"MFC2 setpoint > range @ ignition"
"MFC1 setpoint < 3% range @ full Load"
"MFC1 setpoint > range @ full Load"
"MFC2 setpoint < 3% range @ full Load"
"MFC2 setpoint > range @ full Load"

In such cases you will have to modify your operating parameters accordingly.

4 Registering new MFCs

The registration of new MFCs to the controller is only possible in MFC control mode.

The device has an internal memory with which it can administer 23 VÖGTLIN or BRONKHORST MFCs. The adding or registration of new MFCs to this memory takes place by having an MFC with the MODBUS address 247 in *switched off state* (delivery state) connected to the device in addition to the MFCs that are already registered and switching the device on *afterwards*.

A screen then appears, with a separate touch button displayed for every registered MFC. You can use the buttons to make settings for the relevant MFC.

Even if an MFC is electrically separated from the device, its associated button will be preserved at first. You may plug this MFC back in again. If you press the button of an MFC that is not available, the message „Not available" appears on the screen for two seconds, followed by the normal display.

To permanently remove an MFC from the system, press the „Menu" button and then press the „Rescan" button. During the scanning all registered MFCs are then tested to determine whether they are present. Those that are not detected are removed from the list. After that any resulting gaps in the consecutive numbering are filled by „pushing" numbers from the rear to the front so that there is always a consecutive numbering on the display.

As you can see, registering new MFCs requires their being set to MODBUS address 247. Since one cannot always know for certain, the device offers the possibility of forcing *all connected MFCs* to be set to address 247 via the button sequence „Menu" and „All 247". Once you have done this with several connected MFCs, you would then electrically separate all the MFCs from the device (*please, also in switched off state*) and after that register the MFCs one after the other by repeating the following operation

- Switch off
- Plug in the next MFC
- Switch on

Since both the scanning and the setting of the address constitute serious interventions in the system, these functions are also followed by an „Are you sure?" prompt.

For the function „Master-Slave" you need to keep in mind that for a Master-Slave mixer there must always be one MFM at an odd address and one MFC at an even address.

MFCs with addresses 1 and 2 are used for the „Burner controller" function.

If you register a device from BRONKHORST, make certain that the lateral rotary switches for the MODBUS address are at „00". This is the only way PCU-10 can dynamically change the address of the device.

5 Repair Instructions

Repairs can only be made after prior consultation with the manufacturer. All warranties expire in the case of unauthorized repairs, add-ons or retrofitting.
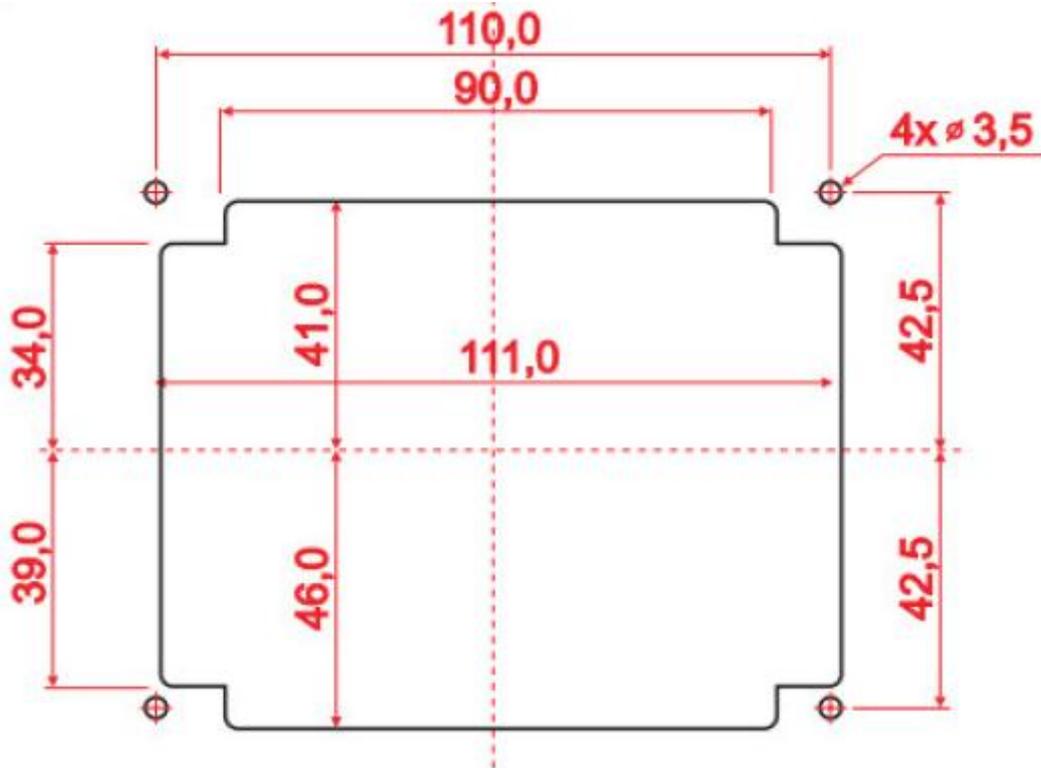
6 Installation Guide for Panel Mount Version

View from the front on the touch screen from operator side. All dimensions are mm.

Top

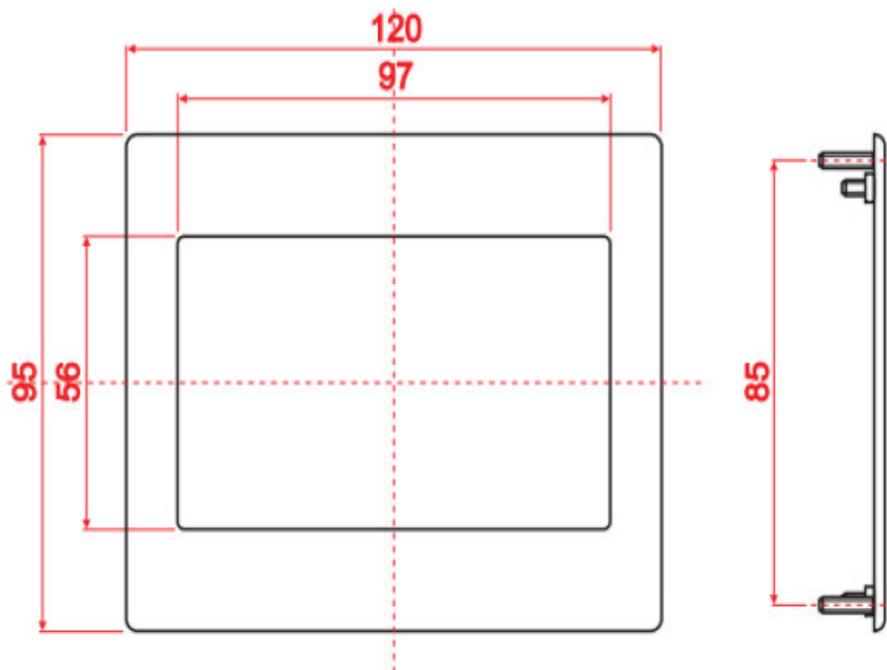Front   ribbon cable opening
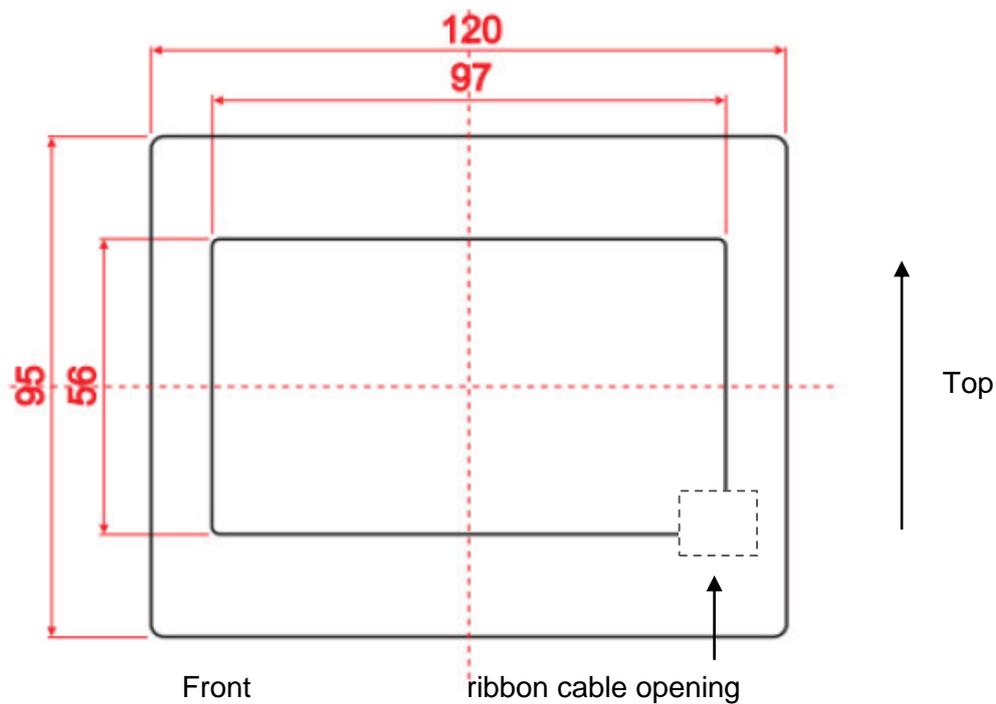
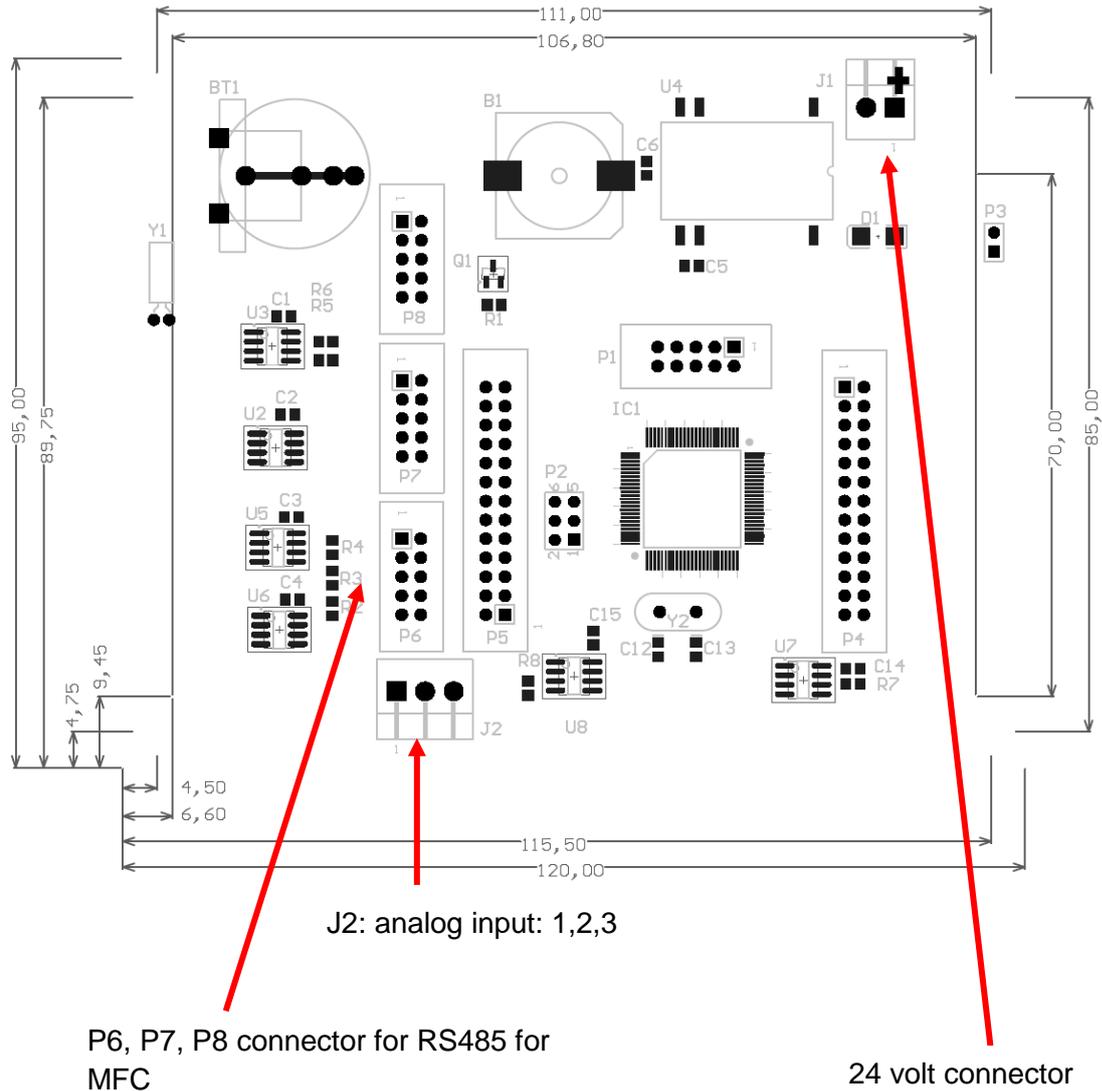Caution: the ribbon cable must be placed as indicated.

Dimensions of the front cut out including 4 drillings:

The four pre installed distance pins are planned for a front wall thickness of 2 mm und should be adjusted to the actual wall thickness.

Front and side view:

J2: analog input: 1,2,3

P6, P7, P8 connector for RS485 for MFC

24 volt connector

Connector sockets on the display pcb:

J1: 24 Volt connector, the included black and red cable adapter (black - / red +) is pre configured and has to be connected to the included power supply V- and V+.
Make sure a proper grounding of the power supply is given.

J2: Analog input for a external signal: 1:+24 Volt, 2: + Signal, 3: - Signal

P1: this socket is for software updates operated by service personnel only.

P6, P7, P8 – connector for RS485 Modbus to MFC. All three sockets can be used for the Modbus network. According to the 3,2 A output of the power supply max. 10 MFCs can be hooked to one PCU-10.

SUB D connector table
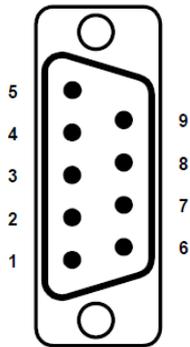
1	Common (-)	0 Vdc Analoge Signale
2	Supply 0 Vdc	0 Vdc Speisespannung
3	Supply +24 Vdc	+24Vdc Speisespannung
4	Output (+)	Analogausgang, Messwert
5	Setpoint (+)	Analogeingang, Sollwert
6	Tx+ RS-485	RS-485 Output (Y)
7	Tx- RS-485	RS-485 Output (Z)
8	Rx- RS-485	RS-485 Input (B)
9	Rx+ RS-485	RS-485 Input (A)