



Static Air/Gas Mixer

P/N 30.49.xxx

Installation Instruction



Original installation instruction

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1 General Information

Read through this operating manual carefully before use and become familiar with the product. Installation and start-up should not be carried out before reading and understanding this document. Keep this manual readily available so that you can reference it as needed.

1.1 What Is the Purpose of this Installation Instruction?

This installation instruction serves as an aid for the installation of the product and supports the technical staff with all maintenance tasks to be performed. Furthermore, this instruction is aimed at preventing dangers to life and health of the user and third parties.

1.2 Who Is this Installation Instruction Targeted to?

This installation instruction provides a code of conduct for personnel tasked with the setup, operation, maintenance, and repair of gas engines. A certain level of technical knowledge with respect to the operation of gas engines and basic knowledge of the electronic components used are necessary. Persons who are only authorized to operate the gas engine shall be trained by the operating company and shall be expressly instructed concerning potential hazards.

1.3 What Symbols Are Used in the Installation Instruction?

The following symbols are used in this instruction and must be observed:



Example

This symbol indicates examples, which point out necessary handling steps and techniques. In addition, you receive additional information from the examples, which will increase your knowledge.



Notice

This symbol indicates important notices for the user. Follow these. In addition, this symbol is used for overviews that give you a summary of the necessary work steps.



Warning

This symbol indicates warnings for possible risks of property damage or risks to health. Read these warning notices carefully and take the mentioned precautionary measures.



Danger

This symbol indicates warnings for danger to life, especially due to high voltage. Read these warning notices carefully and take the mentioned precautionary measures.

2 Safety Instructions

2.1 General Safety Instructions

MOTORTECH equipment is manufactured as state of the art and therefore safe and reliable to operate. Nevertheless, the equipment can cause risks or damage can occur if the following instructions are not complied with:

- The gas engine must only be operated by trained and authorized personnel.
- Observe all safety instructions of the system and all safety instructions of the system operator.
- Operate the equipment only within the parameters specified in the technical data.
- Use the equipment correctly and for its intended use only.
- Never apply force.
- For all work such as installation, conversion, adaptation, maintenance, and repair, all equipment must be disconnected from the mains and secured against unintentional reactivation.
- Perform only such maintenance and repair work as is described in this installation instruction, and follow the instructions given while working.
- Only use spare parts supplied by MOTORTECH for the maintenance of the device.
- Further work must only be performed by personnel authorized by MOTORTECH. Non-compliance with the instructions will void any warranties for the proper function of the equipment as well as the responsibility for the validity of the certifications.
- Safety devices must not be dismantled or disabled.
- Avoid all activities that can impair the function of the equipment.
- Operate the equipment only while it is in proper condition.
- Investigate all changes that occur during operation of the gas engine or electronic engine control.
- Ensure compliance with all laws, directives, and regulations applicable to the operation of your system, including such not expressly stated herein.
- If the system is not entirely tight and sealed, gas may escape and result in explosion hazard. The inhalation of gas can also lead to death or severe health damages. Therefore, upon completion of all assembly works, always check the system's tightness.
- Always ensure adequate ventilation of the engine compartment.
- Ensure a safe position at the gas engine.
- There is a risk of burning on hot surfaces. Allow the gas engine to cool down before starting any work.
- Personal protective equipment (PPE), e.g. safety shoes and gloves, must be worn during all work on the gas engine.
- Noise from the system can cause permanent or temporary damage to your hearing. Wear suitable hearing protection at the system.
- Your behavior can reduce possible residual risks to a minimum. Observe responsible handling of the gas engine and the gas-carrying system.

2.2 Special Safety Instructions for the Device



Gas! Danger to life!

Leaking gas may cause death or serious health damage if inhaled. Upon completion of all assembly works, always check the system's tightness. When operating a static air/gas mixer, make sure that the gauge port is closed.

All works involving gas-carrying parts must be executed by trained personnel only.



Explosion hazard!

If the system is not entirely tight and sealed, gas may escape and result in explosion hazard. Upon completion of all assembly works, always check the system's tightness.

All works involving gas-carrying parts must be executed by trained personnel only.



Risk of burning!

The surfaces of the system may heat up to high temperatures.

2.3 Proper Transport

Transport the static air/gas mixer to the installation site unopened in its original carton.

2.4 Proper Storage

Clean the static air/gas mixer before storing. Store the static air/gas mixer in the original packaging in a dry and clean place on even ground.

2.5 Proper Disposal

For the proper disposal of MOTORTECH equipment, observe the information provided at www.motortech.de.

3 Intended Use

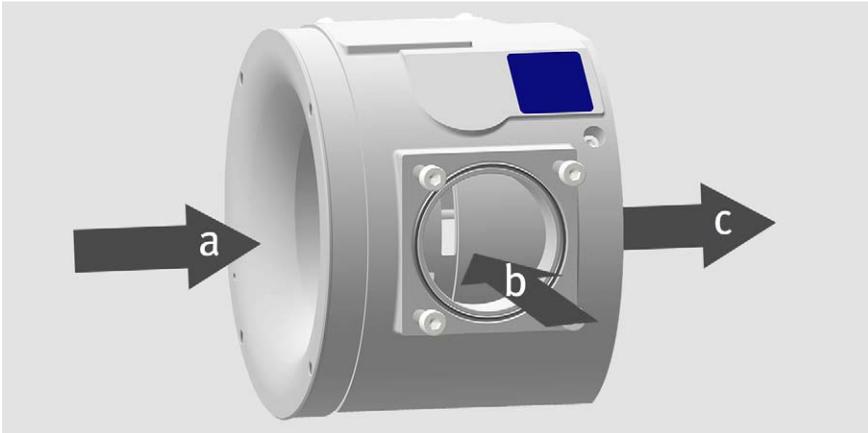
3.1 Functional Description

All graphics used in this section represent an example of a 200-120 series static air/gas mixer.

Basic Design

The main task of the gas mixer is it to mix the fuel (gas) and the air so that an optimal combustion is ensured within the gas engine. Here, the decisive optimization parameters are a high degree of efficiency and low emissions that comply with relevant regulations.

In the static air/gas mixer, gas and air are mixed based on the Venturi principle. Based on the suction pressure of the engine, the air is sucked in through the air inlet **a** into the Venturi nozzle. This creates an underpressure at the narrowest place, which causes the gas to be sucked in through the gas inlet **b**. In this way, both the gas and the air are mixed and released at the mixture outlet **c**. The volume flow and thus the air/gas mixture can be adapted to the respective engine by using different design sizes and different flow bodies in the Venturi nozzle. Using an optionally available adjusting screw from MOTORTECH, the gas supply at the gas inlet can also be manually adjusted if needed.



Connections

All static air/gas mixers also have the following connections:

- An impulse line connection for connecting the air inlet to a balance or zero pressure regulator
- A gauge port for measuring the gas pressure at the gas inlet by a pressure gauge

3.2 Applications

All static air/gas mixers are designed for use with gas-powered Otto engines.

The static air/gas mixers are suited for clean gases with consistent quality. The following substances are approved as fuels: Natural gas, liquefied natural gas (LNG), liquefied petroleum gas (LPG)

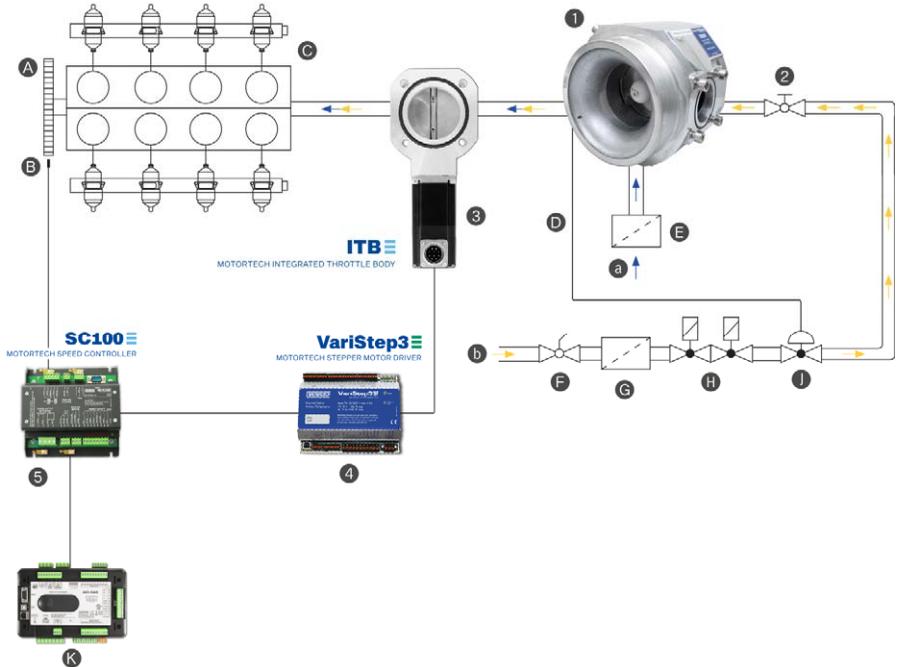
Mixing the air and fuel with the static air/gas mixer must be done with the same pressure, therefore it is necessary to use a balance or a zero pressure regulator within the gas train.

The static air/gas mixer can mix up to two gases with air.

3 Intended Use

Any use other than the one described in the installation instruction shall be considered improper use and will result in the voiding of all warranties.

System Overview (Example)



- 1 Static air/gas mixer
- 2 Adjusting screw (optional)
- 3 ITB throttle body with integrated stepper motor
- 4 VariStep3 stepper motor driver
- 5 SC100 speed controller
- a Air
- b Gas
- A Flywheel
- B Magnetic pickup
- C Engine
- D Impulse line
- E Air filter
- F Ball valve
- G Gas filter
- H Double safety valve
- J Balance/Zero pressure regulator
- K Master control

4 Product Description

4.1 Technical Data

4.1.1 Mechanical Data

The series of the static air/gas mixer have the following mechanical characteristics:

Feature	Value
Dimensions	See chapter <i>Overview Drawings</i> on page 12
Weight	Series 100-60: 2.3 kg (5 lbs) Series 140-80: 3.5 kg (7.6 lbs) Series 200-120: 6.1 kg (13.5 lbs)
Shape of device	See chapter <i>Overview Drawings</i> on page 12
Climatic environmental conditions	Operating and storage temperature: –20 °C to +80 °C (–4 °F to +176 °F) Max. temperature of the media flowing through: +50 °C (+122 °F) Max. humidity without condensation up to 2,000 m (6,561') above sea level: – 85 % at +80 °C (+176 °F) – 60 % at –20 °C (–4 °F)
Chemical resistance	Water, oil, gaseous fuels
Air consumption min./max.	Series 100-60: 100 m ³ /h to 650 m ³ /h Series 140-80: 200 m ³ /h to 1,300 m ³ /h Series 200-120: 500 m ³ /h to 3,600 m ³ /h
Available flow body sizes	23 mm, 30 mm, 40 mm, 60 mm, 70 mm, 80 mm, 90 mm Suitability depending on series

4.1.2 Warning Notices on the Device

Warning on Removable Gas Inlet Cover



Don't touch inside

4 Product Description

4.1.3 Product Identification – Labeling on the Device

Nameplate Static Air/Gas Mixer on Upper Part of Housing



Illustration example

Abb.	Meaning
P/N	Article number of the static air/gas mixer
S/N	Serial number of the static air/gas mixer

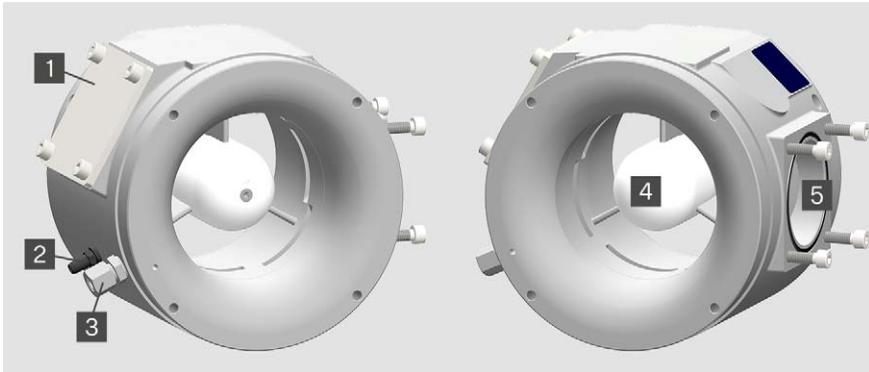
The field *Flow Body Size* is reserved for the label that comes with the flow body. For further information, refer to the section *Install Flow Body* on page 18.

4 Product Description

4.1.4 Overview Drawings

Components

The following drawing shows an example of a 200-120 series static air/gas mixer. The exact position of the individual parts varies slightly with other series. A detailed layout can be found in the subsequent section *Dimensions*.

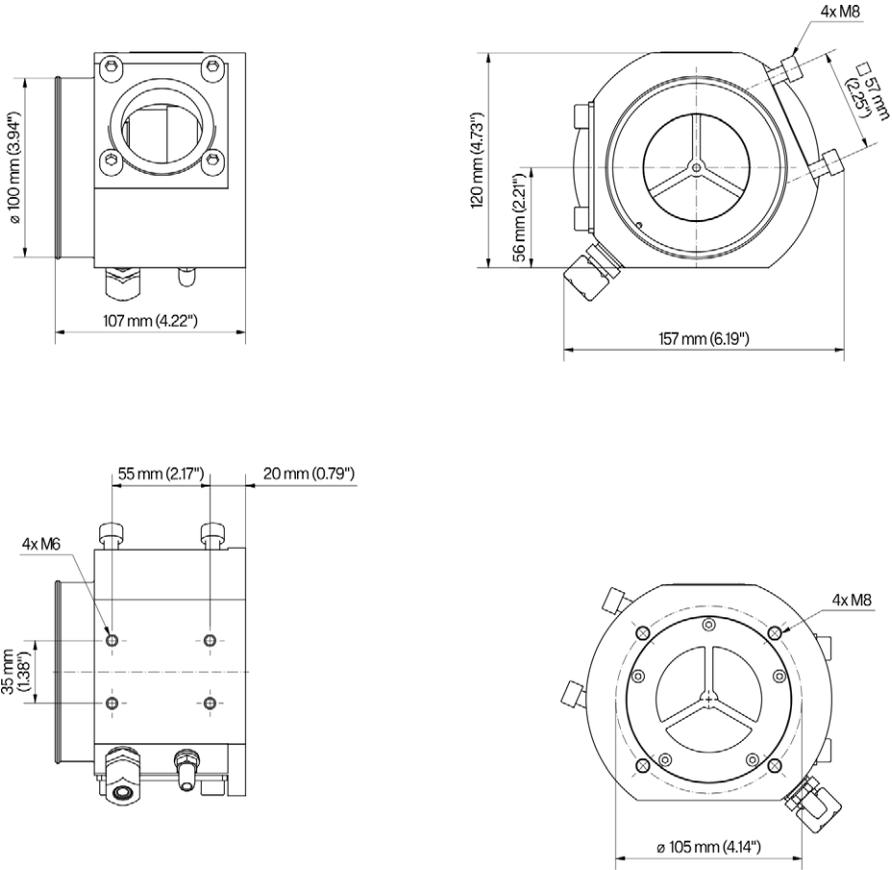


Pos.	Description
1	Gas connection (here closed with a cover)
2	Gauge port for gas pressure measurement at the gas inlet by a pressure gauge
3	Impulse line connection (cutting-ring connection) for connecting the air inlet to a balance or zero pressure regulator
4	Flow body
5	Gas connection

4 Product Description

Dimensions

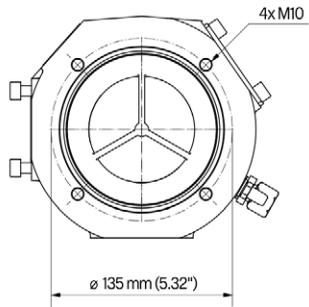
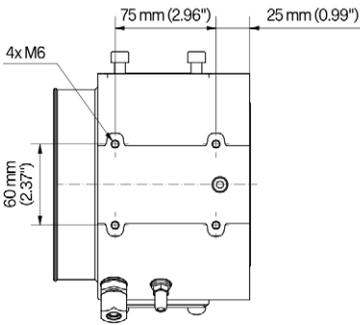
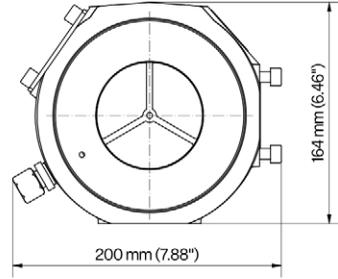
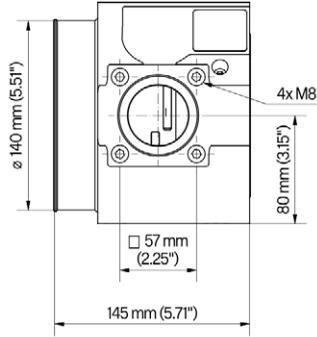
Series 100-60
Static air/gas mixer



4 Product Description

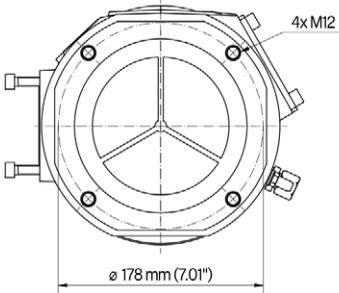
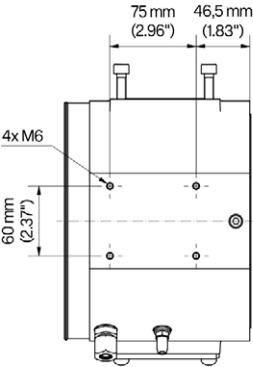
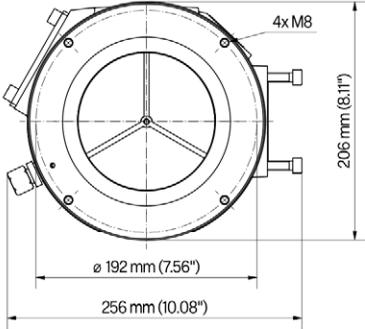
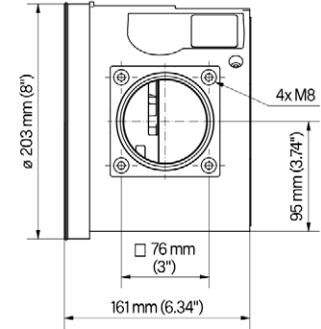
Series 140-80

Static air/gas mixer



4 Product Description

Series 200-120
 Static air/gas mixer



5 Installation Instructions

5.1 Unpacking

Unpack the device, taking care not to damage it, and ensure that the installation instruction is always stored with the device and is easily accessible. Check the contents for completeness and verify that the device type meets your application requirements.

Scope of Supply

The scope of supply of the static air/gas mixer body consists of the following components:

- Static air/gas mixer
- Gasket for mixture outlet flange
- Installation instruction

Accessories

- Flow body
- Optional: Mounting flanges for gas inlet and mixture outlet
- Optional: Adjusting screw

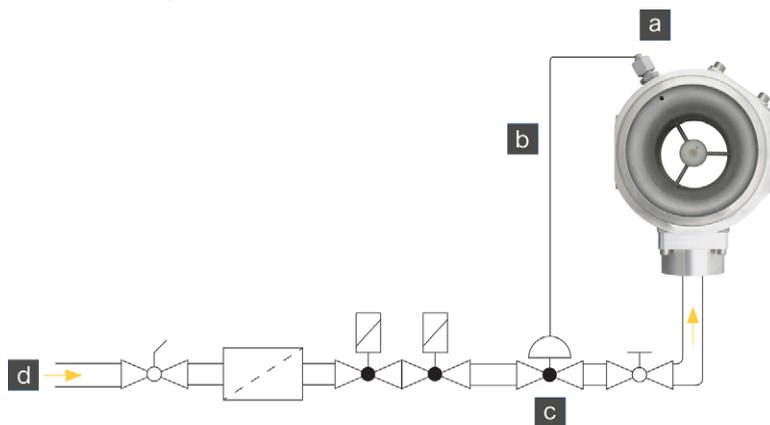
5.2 Installation

The following steps must always be carried out and are specified in more detail in the following:

- Install flow body
- Install static air/gas mixer into intake section (air and gas inlet plus mixture outlet)

For optimum performance according to its design, it is important that air and fuel are mixed in the static air/gas mixer at the same pressure. Therefore, only operate the static air/gas mixer with a balance or zero pressure regulator. The balance or zero pressure regulator must be connected to the impulse line connection of the static air/gas mixer and it must be installed in the gas train at a suitable position before the gas inlet of the static air/gas mixer.

Connection Example



Pos.	Description
a	Impulse line connection
b	Impulse line
c	Balance/Zero pressure regulator
d	Gas

5 Installation Instructions

5.2.1 Install Flow Body

To install or replace the flow body, free access must be provided at the static air/gas mixer on the air inlet.

Proceed as follows:

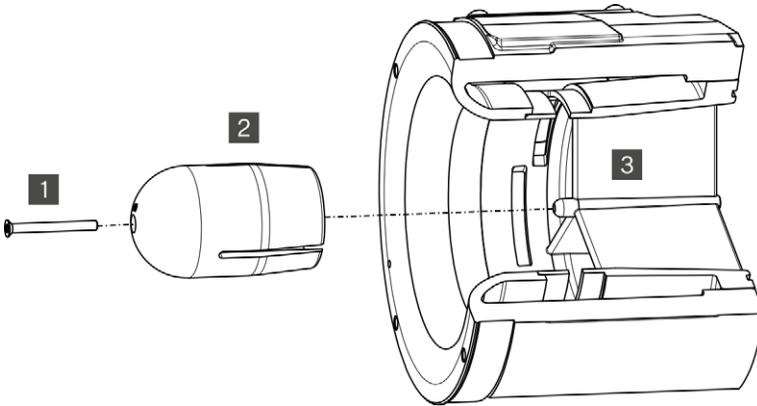


Illustration example

1. A label is enclosed with the flow body. Stick this label onto the field *Flow Body Size* of the nameplate from the static air/gas mixer. This way, you can identify which flow body size is used when the gas mixer is installed.



**Flow Body
Size XX,X mm**

2. On the air intake side, slide the flow body **2** onto the center of the outlet nozzle **3** as far as it will go.
3. Moisten the countersunk screw **1** with thread lock fluid.
4. Fix the flow body on the central nozzle ring by inserting the countersunk screw **1** into the flow body **2** as far as it will go and then tightening it firmly.

5.2.2 Install Static Air/Gas Mixer into Intake Section

The mounting position of the static air/gas mixer is arbitrary. For mounting, use the four threaded holes and the flat surface on the bottom side of the device.

The following must be observed during installation:

- The static air/gas mixer must be mounted tension-free, i.e. all bores of the flanges must be aligned with the housing bores.
- For the mixture outlet, consider the additional depth of the engine-specific mounting flange.
- For the air inlet, gas inlet and mixture outlet, use only galvanized hexagon bolts.
- Tighten the screws firmly enough so that all connections are gas-tight. Use a suitable torque that matches the strength of the screw.
- During installation, make sure that no loose parts get into the static air/gas mixer.

Generally, you need to connect the following ports:

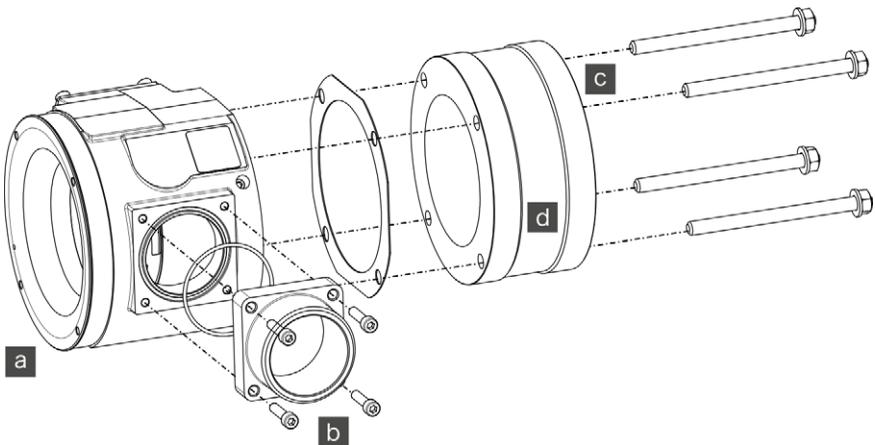


Illustration example



Explosion hazard!

If the system is not entirely tight and sealed, the combustible gas mixture may escape and result in an explosion hazard. Therefore, all ports and connections must be gas-tight. Use suitable clean seals and connecting materials.

5 Installation Instructions



Risk of injury!

When connecting the cables, your fingers may get stuck. For this reason, under no circumstances should you reach into the openings and gaps of the static air/gas mixer when connecting the lines.

- **Air Inlet** **a**
Hose connection (such as with clamp, seal, and counter flange)
- **Gas Inlet** **b**
Connection of a flexible gas line via a mounting flange. It is particularly important that the gas line is flexible if the gas mixer is rigidly coupled with the engine. Two gas connections are available (see positions **1** and **5** in the section *Overview Drawings* on page 12). If required, the cover can be modified accordingly. For two-gas operation another adapter must be ordered in order to be able to use both gas connections simultaneously.
- Optional: **Adjusting Screw**
If needed, insert adjusting screw available from MOTORTECH into the mounting flange at the gas inlet or into the gas line between mounting flange and balance or zero pressure regulator
- **Mixture Outlet** **c**
Connection via a bolt hole circle for engine specific mounting flange **d** (available with clamp, seal, and counter flange)
- **Impulse Line Connection**
Cutting ring connection for the impulse line of the balance or zero pressure regulator (see position **3** in the section *Overview Drawings* on page 12) for connection to the air inlet of the static air/gas mixer. For optimum performance in accordance with its design, the static air/gas mixer must be operated with a balance or zero pressure regulator (see section *Installation* on page 16). The connection is suitable for hoses with an outside diameter of 10 mm (0.4").
- Optional: **Gauge Port**
Connection for the measuring lead of a pressure gauge (see position **2** in the section *Overview Drawings* on page 12) to measure the gas pressure at the gas inlet of the static air/gas mixer. The connection is suitable for hoses with an inside diameter of 8 mm (0.31").

6.1 Start-up



Explosion hazard!

If the system is not entirely tight and sealed, the combustible gas mixture may escape and result in an explosion hazard. Always check the tightness of the system before start-up. Upon completion of your works, make sure that you close the gauge port on the static air/gas mixer.

Basic Settings of the System

The static air/gas mixer is a Venturi mixer. For optimum performance according to its design, it is important that air pressure and gas pressure are equal, so that the gas is sucked in by the Venturi effect alone. Therefore, operate the static air/gas mixer solely with a balance or zero pressure regulator connected to the air inlet of the static air/gas mixer via the impulse line connection. Also, adjust the balance/zero pressure regulator in such a way that the balance/zero pressure regulator equalizes the gas pressure with the air pressure. Otherwise, if the connection or adjustment is incorrect, the gas will be forced into the gas mixer and not sucked in alone, which can lead to a performance loss.

Problems When Starting

Often the gas engine's problem is its starting performance. With the starting speed the air speed in the gas mixer is very low, which will cause very low suction pressure at the gas inlet. This can lead to not enough gas being sucked into the engine to make the mixture ignite. The cause may be that, for example, the nominal diameter of the flexible gas line is smaller than that of the gas mounting flange or the diameter of the gas mounting flange is too small to discharge sufficient gas into the engine at low suction pressure. Check in any case whether the gas supply to the static air/gas mixer is sufficiently dimensioned. If you have any questions, contact MOTORTECH (see *Customer Service Information* on page 23).

Engine Does Not Reach Nominal Power

With the prescribed emissions, the engine does not reach its nominal power. The following scenarios might be possible:

Scenario 1:

- The nominal power is reached by enriching the mixture via the optional adjusting screw.
- At the gauge port of the static air/gas mixer, an underpressure greater than 30 mbar is measured.

In this case, it is necessary to increase the air supply. This can be achieved based on the following measures:

- Check air filter for dirt or excessive back pressure. Clean or replace air filter if necessary.
- Check underpressure in the air intake line (standard value: –5 mbar to –25 mbar)
- Install a smaller flow body. To do so, please contact MOTORTECH (see *Customer Service Information* on page 23).

6 Operation

Scenario 2:

- The nominal power is not reached even by enriching the mixture via the optional adjusting screw.
- At the gauge port of the static air/gas mixer, an underpressure less than 60 mbar is measured.

In this case, it is necessary to increase the gas supply. This can be achieved by carrying out one of the following measures:

- Install larger flow body
- Use larger gas mounting flange

To do so, please contact MOTORTECH (see *Customer Service Information* on page 23).

7.1 Customer Service Information

You can reach us during our business hours by:

Phone: +49 514193 99 0

Email: service@motortech.de (technical support)
sales@motortech.de (all other matters)

7.2 Returning Equipment for Repair / Inspection

To return the device for repair and inspection, first consult your MOTORTECH contact person (see *Customer Service Information* on page 23). From him you will receive all the information you need to process your order quickly and smoothly. For return shipment, also observe the instructions in the section *Instructions for Packaging the Equipment* on page 23.

7.3 Instructions for Packaging the Equipment

For return shipment, equipment should be packaged as follows:

- Use packaging material that does not damage the equipment surfaces.
- Wrap the equipment with sturdy materials and stabilize it inside the packaging.
- Use sturdy adhesive film to seal the packaging.

8 Maintenance

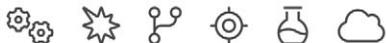
8.1 Maintenance Instructions

The static air/gas mixers may only be used with clean approved gases (see section *Applications* on page 8). If this condition is observed, the static air/gas mixers are maintenance-free.

8.2 Spare Parts and Accessories

For spare parts and accessories, please refer to our current Product Guide, which is available for you to download on the internet at www.motortech.de.

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MOTORTECH GmbH

Hunaeusstrasse 5
29227 Celle
Germany

☎ +49 5141 93 99 0
✉ sales@motortech.de
🌐 www.motortech.de

MOTORTECH Americas, LLC

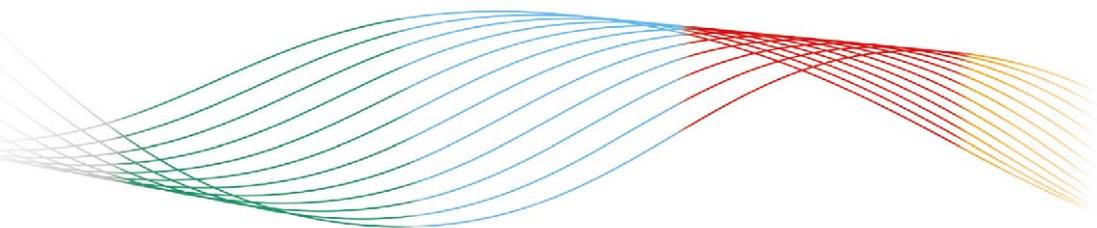
1400 Dealers Avenue, Suite A
New Orleans, LA 70123
USA

☎ +1 504 355 4212
✉ info@motortechamericas.com
🌐 www.motortechamericas.com

MOTORTECH Shanghai Co., Ltd.

Room 1018 Enterprise Square,
No. 228 Meiyuan Road,
Jing'An District, 200070 Shanghai
China

☎ +86 21 6380 7338
✉ info@motortechshanghai.com
🌐 www.motortechshanghai.com



GAS ENGINE TECHNOLOGY

