## Comparison Gas Mixer types
### smart-comfort-advanced

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>smart</td>
<td>comfort</td>
<td>advanced</td>
</tr>
<tr>
<td><strong>Max. performance gas mixture</strong></td>
<td>15 Nm³/h, 25 Nm³/h, 50 Nm³/h, 100 Nm³/h</td>
<td>3 Nm³/h to 150 Nm³/h, customer specific other</td>
</tr>
<tr>
<td>Number of gases</td>
<td>2</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Types of gases</td>
<td>Technical gases, flammable and not flammable</td>
<td>Technical gases, flammable and not flammable</td>
</tr>
<tr>
<td>Media temperatures</td>
<td>from -20 to +50°C</td>
<td>from -40 to +60°C</td>
</tr>
<tr>
<td>Suitability</td>
<td>Cold resistant</td>
<td>To -196°C</td>
</tr>
<tr>
<td>If equipped with buffer vessel</td>
<td>Stainless steel, 10 barg, clocked filling via pressure switch</td>
<td>Stainless steel, 25 barg, clocked filling via pressure switch</td>
</tr>
<tr>
<td>Gas mixture control</td>
<td><strong>Static</strong> Gas Mixer: Adjusting via dosing valves, data reading from pressure gauge and flow meter Accuracy: +/- 0,5%</td>
<td><strong>Static</strong> Gas Mixer: Adjusting via dosing valves, data reading from pressure gauge and flow meter Accuracy: +/- 0,5%</td>
</tr>
<tr>
<td>Special features</td>
<td>- Long living</td>
<td>- Long living</td>
</tr>
<tr>
<td></td>
<td>- Safe</td>
<td>- Safe against cold gas break through</td>
</tr>
<tr>
<td></td>
<td>- Maintenance friendly</td>
<td>- Maintenance friendly</td>
</tr>
<tr>
<td></td>
<td>- Max. outlet pressure <strong>9 barg</strong></td>
<td>- Max. outlet pressure <strong>22 barg</strong></td>
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</tbody>
</table>
**Differences** in Gas Mixer concepts:

- **smart:** Static Gas Mixer with manual adjustment, optionally with buffer vessel 10 barg
- **comfort:** Static Gas Mixer with manual adjustment, optionally with buffer vessel 25 barg
- **advanced:** Dynamic Gas Mixer with electronic control, typically without buffer vessel, IOT compliant

Dynamic LT Gas Mixer are comparable in price to gas static mixers - if the static gas mixer is equipped with buffer tank and gas analyzer - please inquire.

**The same** applies to all gas mixer concepts:

- Optional equipment with gas analyzer
- Documentation of gas analysis values
- Gas mixture withdrawal can also be switched on and off remotely via solenoid valve
- Technically tight on permanence
- High quality and reliable fittings and components for demanding production environments
- Robust design, resistant to environmental influences
- Easy accessibility and maintenance
- Automatic restart after standstill

**Wide range of high quality Gas Mixer for every application**

You have the choice from 72 standard gas mixer models. In addition to these serial models, customized solutions are our specialty. Only one thing remains the same for all models: highest quality, long service life, excellent gas mixtures and intuitive operation.
Serial-Gas Mixer Type comfort and Type smart

Here you will find a wide selection of high-quality Gas Mixer for every application. This brochure describes serial Gas Mixer of the two types comfort and smart:

Gas Mixer

- for not flammable gases
- for flammable gases
- for two or three gases
- with or without buffer vessel inside the or outside of the Gas Mixer cabinet
- with or without Gas-Analyzer, connected with or separated from the Gas Mixer

You have the choice from 72 Gas Mixer serial models.

In addition to this proven standard, customized solutions are our specialty.
**Special features of LT GAS MIXER**

**Always full performance:** The specified performance is continuously provided, regardless of the output pressure ⇒ **Stabile production**

**Highest reproducibility:** ≤ ± 0.5 Vol% guaranteed (at temperature uniformity of the individual gases) ⇒ **Safe production quality**

**Different inlet pressures possible:** Even with significant input pressure differences of more than 3 bar, a constant, reproducible mixing ratio is guaranteed at all times. ⇒ **Saving** of the installation of additional pressure controllers is not necessary.

**Standard fittings:** Standard-fittings safe quick replacement ⇒ **Availability**

**No hoses:** Leakages through embrittlement are avoided ⇒ **Safe**

**No universal valves:** All metering and controlling valves used are tailored to each required flow capacity and are carefully selected. Only specific metering valves offer a sufficient degree of accuracy and comfort in the gas mixture setting. ⇒ **High accuracy**

**Optical display:** Min. six pressure gauges and two flow meters deliver reliable the performance data and allow for an easy and quick function control through the window in the front door ⇒ **Extensive control options**

**Bypass for the buffer vessel:** Independent from the stored gas mixture a precise analysis and control of the flowing gas is possible. ⇒ **Support during commissioning and changes of gas composition**

**Weather protection:** LT GAS MIXER are as well suitable for outdoor placement

**Easy maintenance:** Easy access to all installations. Main valves are mounted on detachable connections and can quickly be removed and installed. Filters and dome pressure regulators can be serviced in installed condition. ⇒ **Customer service staff loves LT GAS MIXER**
Customer specific solutions

Customer specific solutions are available from LT GASETECHNIK e. g. with suitability for

- extremely low pressure loss
- exceptional installation locations
- extreme operating temperatures
- corrosive or aggressive gases
- especially high or low inlet and outlet pressures
- Industrial IoT

Please contact us!

Only one thing remains the same for all models: highest quality, long service life, excellent gas mixtures and intuitive operation.

Individual solution? - With pleasure!
## Cost advantages

When comparing LT Gas Mixers to competing products, please be fair enough to look at the details. To make it easier for you, we prepared the following table where you could fill in the additional costs or costs savings in comparison to LT Gas Mixer.

<table>
<thead>
<tr>
<th>Name</th>
<th>Cost</th>
<th>Explanation (in relation to LT Gas Mixers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas filter</td>
<td>All supply lines include gas filters as standard</td>
<td></td>
</tr>
<tr>
<td>Pressure controller</td>
<td>All supply lines include dome loaded pressure controllers; there are no additional medium pressure controllers to install upstream.</td>
<td></td>
</tr>
<tr>
<td>Bypass buffer vessel</td>
<td>Useful for commissioning, inspection, adjustment</td>
<td></td>
</tr>
<tr>
<td>Blow off line Buffer vessel</td>
<td>Useful for commissioning to discharge gas mixture past the consumer</td>
<td></td>
</tr>
<tr>
<td>Complete documentation</td>
<td>Declaration of Conformity Pressure Equipment (PED) and Low Voltage (EMC); TÜV Certificate of Conformity (PED) Module G; Operating instructions are included in the total price</td>
<td></td>
</tr>
<tr>
<td>USB-interface on the front of the housing front (of the gas analyser)</td>
<td>Competitor often calculate extra costs</td>
<td></td>
</tr>
<tr>
<td>Ethernet-interface (for the gas analyser)</td>
<td>Competitor often calculate extra costs</td>
<td></td>
</tr>
<tr>
<td>Data logging (in the gas analyser)</td>
<td>Competitor often calculate extra costs</td>
<td></td>
</tr>
<tr>
<td>Password protected touch screen (in the gas analyser)</td>
<td>Competitor often calculate extra costs</td>
<td></td>
</tr>
<tr>
<td>For Gas Mixers performing 100 Nm³/h and 200 Nm³/h a 90 l buffer vessel is sufficient</td>
<td>Competitor often offer larger buffer vessels</td>
<td></td>
</tr>
<tr>
<td>The number (15, 25, 50, etc.) at LT GAS MIXER stands for gas mixture performance in Nm³/h</td>
<td>Depending on the type of gas and the pressures, a competitor names the gas mixer with a number 100 but this has to be compared with a LT GAS MIXER with a performance number of 50. (Please refer to own chapter)</td>
<td></td>
</tr>
</tbody>
</table>
### Not clearly monetarily assessable advantages – but valuable in a total cost of ownership review

<table>
<thead>
<tr>
<th>Maintenance</th>
<th>Easy accessibility of all fittings at LT-Gas mixers does not require &quot;rubber hands with a surgeon's tool&quot;, thus significantly simpler and faster maintenance. Maintenance possible without dependence on the gas mixer manufacturer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure of fitting</td>
<td>Repair with standard components at delivery times &lt;2 weeks No threat of long-term failure.</td>
</tr>
<tr>
<td>High mixing accuracy with large adjustment range</td>
<td>Guaranteed +/- 0,5 %; Is achieved by the dynamic control of the volume flow instead of static control by metering valve</td>
</tr>
<tr>
<td>No hoses</td>
<td>Technically tight on permanence</td>
</tr>
<tr>
<td>Visualizations of the gas flow</td>
<td>Fast troubleshooting through easy and permanent readability of 5 pressure gauges and 2 mass flow meters</td>
</tr>
<tr>
<td>Modular expandability / Upgradability</td>
<td>When changing the performance (e.g., 50 to 100 Nm³/h) or of the mixing gases, often only one gas track has to be partially replaced, for very manageable costs</td>
</tr>
<tr>
<td>Long life</td>
<td>The solidity of LT Gas Mixer is proven in several cases by their ages of 30 years and more. LT does not stop servicing after 15 years!</td>
</tr>
</tbody>
</table>
**Technical features type comfort**

**Performance classes**
We supply serial gas mixers of the type comfort in the following performance classes. This quantity in Nm³/h is meant as a gas mixture amount, more in its own section.

**Non-flammable gases or MAP-gases for food, for two gases:**
- GM 15-2 comfort: 1 ... 15 Nm³/h
- GM 25-2 comfort: 2 ... 25 Nm³/h
- GM 50-2 comfort: 5 ... 50 Nm³/h
- GM 100-2 comfort: 10 ... 100 Nm³/h
- GM 200-2 comfort: 20 ... 200 Nm³/h
- GM 300-2 comfort: 30 ... 300 Nm³/h
- GM 500-2 comfort: 50 ... 500 Nm³/h
- GM 1000-2 comfort: 100 ... 1000 Nm³/h

**Non-flammable gases or MAP-gases for food, for three gases,**
as before, in the same performance classes:
- GM 15-3 comfort: 1 ... 15 Nm³/h
  ...to...
- GM 1.000-3 comfort: 100 ... 1000 Nm³/h

**Flammable gases, for two gases,**
as before, in the same performance classes:
- GMB 15-2 comfort: 1 ... 15 Nm³/h
  ...to...
- GMB 1.000-2 comfort: 100 ... 1000 Nm³/h

**Flammable gases, for three gases,**
as before, in the same performance classes:
- GMB 15-3 comfort: 1 ... 15 Nm³/h
  ...to...
- GMB 1.000-3 comfort: 100 ... 1000 Nm³/h

All LT GAS MIXER are available with and without buffer vessel and with and without Gas-Analyzer.

**Wide range of proven models**
Technical features type smart

Non-flammable gases or MAP-gases for food, for two gases:

GM 15-2 smart:  1 ...  15 Nm³/h
GM 25-2 smart:  2 ...  25 Nm³/h
GM 50-2 smart:  5 ...  50 Nm³/h
GM 100-2 smart: 10 ... 100 Nm³/h

Flammable gases, for two gases,
as before, in the same performance classes:

GMB 15-2 smart: 1 ...  15 Nm³/h
GMB 200-2 smart: 20 ... 200 Nm³/h

All LT GAS MIXER are available with and without buffer vessel and with and without Gas-Analyzer.

Gas Mixer Performance

The number (15, 25, 50, etc.) at LT GAS MIXER stands for gas mixture performance in Nm³/h with a reserve of about 20%. Some competitors give this information in a different way, which should be taken into account in any comparison. With competitor information you often will have to

- Find out the performance from a matrix gas mixer performance with inlet and outlet pressure,
- Then you will have to find out or calculate the conversion factor which applies for the specific gas mixture
- Finally you will have to multiply the conversion factor with the gas mixer performance,

all this to receive the performance of the gas mixer expressed in gas mixture.

The figures in the name of LT GAS MIXER, on the other hand, indicate the performance of gas mixture (without conversion necessity). In addition, with LT GAS MIXER, inlet and outlet pressures do not affect performance, as long as they are within the permissible ranges (inlet pressure = 12...25 barg, outlet pressure comfort = 2...22 barg outlet pressure smart = 2...9 barg). LT GAS MIXERs are designed individually according to the order-specific data.

From this it is also very clear that at first a comparable technical comparability depending on gas mixture and pressures should be produced, since the number in the name of some competitor gas mixer is not clear. Depending on the type of gas and the pressures, a competitor names the gas mixer with a number 100 but this has to be compared with a LT GAS MIXER with a performance number of 50. In most cases, this correct calculation delivers - in addition to the technical advantage - significant price advantages for the LT GAS MIXER.

These LT advantages are the result of the more sophisticated technical design of the LT GAS MIXER.
**Gas suitability**

LT Gas Mixers are suitable for mixing non-flammable (GM) or flammable (GMB) gases. They can be delivered for mixing two (GM-2 or GMB-2) or three (GM-3 or GMB-3) industrial gases.

**Design pressure**

LT GAS MIXER type **comfort** are suitable for the following pressures:

- Inlet pressure = 12...25 barg
- Outlet pressure = 2...22 barg

LT GAS MIXER type **smart** are suitable for the following pressures:

- Inlet pressure = 12...25 barg
- Outlet pressure = 2...9 barg

**Operating temperature**

Temperatures of the process gases for the type **comfort** are permitted between -40°C and +60°C. Therefore, the additional installation of gas-preheaters is not or very rarely required.

Temperatures of the process gases for the type **smart** are permitted between -20°C and +50°C. Therefore, the additional installation of gas-preheaters is not or very rarely required.

**Body**

LT Gas Mixers are erected inside a lockable steel cabinet with a window in the front door.

Despite their compact structure, the layout is generous. This allows for perfect access during installation and service.
The following sketch shows a LT GAS MIXER for two gases with integrated buffer vessel and gas analyzer:

Gas Mixer without buffer vessel are designed for wall mounting. The cabinet is sized (HxWxD) 1000x800x400 mm. Gas feeding inlet pipes and the gas mixture outlet pipe are to be connected to the pertinent openings at the cabinet’s bottom.

Gas Mixer with buffer vessel are designed for standing on the floor. The cabinet is sized (HxWxD) 1600x800x400 mm. To facilitate alignment the cabinet is added four adjustable feet. Gas feeding inlet pipes and the gas mixture outlet pipe are to be connected to the pertinent openings at the cabinet’s right side.
Once the glass door is unlocked, LT GAS MIXER provide easy access to all fittings. These are mounted via detachable connections, clearly arranged and placed appropriately. This is to quickly and conveniently remove and reinstall them.

Convenient accessibility for maintenance and service:

- Easy readability of all pressures and flows
- Wear parts are interchangeable in the installed state
- Fittings with detachable connections
- Standard components used
- Effortless access to all fittings

The installation site can be outside. We recommend protecting LT GAS MIXER from adverse weather conditions, e.g. from moisture penetration by rainwater and from direct sunlight. If the gas mixer is operated together with an LT GasAnalyzer, an optional heater must be used in the control unit.

The design concept offers a high degree of flexibility. Subsequent modifications to using other gases or to increasing the flow rate are possible with little effort.

Proven design, reliable, durable & easy maintenance
**Inlet gas filter**

As protection for the pressure regulators valve seats, at LT GAS MIXER every gas pipe, whether carrier gas or additive gas, is added an inlet filter. These filters are arranged outside the gas mixer’s cabinet to ensure easy access for maintenance purposes. The replaceable filter cartridge is made of stainless steel for small filters and made of Microplast for large filters (or bronze for oxygen).

**Pressure control and inlet pressure differences**

At inlet of LT GAS MIXER, the admissible pressure level of feeding gases may range from 11 to 25 barg (nominal pressure PN25). In this pressure range it is not necessary to control the inlet pressure upstream the gas mixer. LT GAS MIXER are equipped with a dome loaded pressure controller for each gas track. This allows leveling any differences in gas pressure at inlet, thereby producing a common mixing pressure. These regulators are pneumatically controlled, normally with the carrier gas.

Even if a remarkable pressure difference between individual inlet gases, that means more than 3 bar, LT GAS MIXER ensure a constant and reproducible mixing ratio at all times.
**Flow meter**

LT GAS MIXER are equipped solely with all-metal flowmeters with optical display. These are specifically selected to match the type of gas, the mixing pressure and the nominal flowrate of each individual unit. Results are displayed in Nm3/h.

**Optical display**

LT GAX MIXER allow reading-off the effective flow rates and the prevailing pressure level at all times. Every gas track possesses its own pressure gauge. These measuring devices visualize constantly and reliably all performance data of the Gas Mixer, thereby allowing supervising quickly its function at all times. To this effect, they are generously sized and located at eye’s level. The front door on the Gas Mixer’s cabinet incorporates a window which gives sight to them. This enables a safe and fast function control.
**Dosing valves**
LT GAS MIXER only use dosing and fine dosing valves which are suitable to the nominal capacity of the gas mixer. The desired accuracy in the adjustment of the gas mixture is achieved by means of a careful and case-specific type selection.

**Non-return valves**
LT GAS MIXER incorporate a non-return valve according to EN 730 in each gas pipe. These valves are located shortly ahead of the mixing chamber and distinguish themselves by a low pressure loss. Proper function is ensured even at lowest pressure difference, and thus, backflows are safely prevented.

**Safety features**
In case of total failure of carrier gas the inadmissible enrichment of the gas mixture with additive gas is excluded. To this effect, dome loaded pressure regulators, located on the gas inlet pipes, are controlled by carrier gas. They are normally closed (N/C) and act, therefore, as a shut-off valve.
In the outlet of the mixed gas line, a valve is installed, which is also closed pressure-free and therefore also shuts off. Together with the dome pressure regulators in the gas inlet lines this device forms a double safety.
The following measures are performed automatically:

- If the carrier gas pressure drops, the admixing gas is proportionally adjusted.
- In the event of total failure of the carrier gas, all gas lines are shut off.
- In addition, the outlet valve is shut off.
- When using an LT analyzer, this will monitor the admixing gas concentration in the gas mixture with the limit values entered. Should the set maximum limit value for the permissible concentration be exceeded, the admixed gas supply is immediately locked off. This is done via a 2-2 way solenoid valve, built into the admixed gas inlet line. The output valve is also shut off.

**Connections**

**Carrier gas:** Clamping ring for pipe with outer diameter 18 mm.
- 200 and 300 Nm³/h: 2 x 18 mm

**Admixture gas:** Clamping ring for pipe with outer diameter 18 mm

**Gas mixture in the outlet:** Clamping ring for pipe with outer diameter 18 mm.
- 200 and 300 Nm³/h: 28 mm
**Gas pipes, fittings**

LT GAS MIXER use, without exception, fittings and fasteners of the highest quality. To avoid embrittlement, hoses are not used. Process and control cables are designed exclusively as high quality copper pipelines. They are brazed or clamp-screwed and technically tight at permanence.

**Hysteresis control**

Gas mixers should mix continuously and for at least two seconds, but better longer. During gas mixture consumption the outlet pressure drops. As soon as this pressure reaches the set lower limit (= lower switching point), the gas mixer will automatically switch on and gas mixture will be produced. The gas mixer automatically switches off again as soon as the pressure reaches the set upper limit (= upper switching point).

Gas mixers type **comfort** have a direct-acting pneumatic valve, which is controlled by a control medium (usually the carrier gas), combined with a direct-acting pilot solenoid valve. This combination serves as a gas mixer output side shut-off valve for the gas mixer hysteresis control.

Gas mixer type **smart** have a servo-controlled solenoid valve as a gas mixer-outlet shut-off valve serving for gas mixer hysteresis control.

**Ex-Zone**

LT GAS MIXER are designed to be "**technically tight at permanence**". The mechanical part of the gas mixer does not produce an Ex zone, because fittings and detachable connections comply with the requirements "technically tight at permanence" acc. TRBS 2152 Part 2. This only applies to the mechanical part of the gas mixer.

The electrical part of the gas mixer with control and gas analysis must not be installed in the hazardous area. ATTENTION: The gas mixer as a unit with gas analyser is not suitable for installation in ex-zones. Versions for separate installation are optionally available.

**Buffer vessel**

Buffer vessels are available in various designs. Integrated in the gas mixer cabinet or separately. More details can be found in the corresponding section.
**Integrated gas analyzer**

The analysis of the gas mixture serves the purpose of safety and quality monitoring as well as the documentation of the gas mixing results. Details on the LT GasAnalyzers can be found in the appropriate section. Integration of the LT GasAnalyzer into the LT GAS MIXER cabinet is seamless:

- The sample gas is withdrawn behind the buffer vessel and fed monitored to the analyzer.
- Limit values for the mixing gas concentration can be set via the integrated touch screen. The analyzer continuously monitors the gas mixture and visualizes the measured values in the display. To enable the transmission of measurement data, e.g. to connected systems, the LT GasAnalyzer has several interfaces on the terminal block.
- If the set limit values are exceeded or undercut, an alarm signal is generated and, in addition, the deviation is displayed in the display. The signal is also transmitted via the interfaces, whereby it e.g. can be used to connect a horn or a lamp. For more information about these options, see the appropriate section. Gas mixers for flammable gases (type designation "GMB ..."), have a solenoid valve installed in the admixed gas line. If the set upper limit value is exceeded, the admixed gas flow is shut off with the aid of this valve.
- LT GasAnalyzer are usually mounted on the gas mixer in a lockable cabinet with sight glass door. If this is not possible, the location should be close to the gas mixer to ensure the most timely and unadulterated analysis results possible.
- The LT GasAnalyzer is connected to the LT GAS MIXER at the factory and ready to use.

On request, gas analyzers from other manufacturers can be used as well.
**Cost comparison**

**Function, operation and maintenance**

**Functional principle**
LT GAS MIXER work based on the balanced-pressure mixing-method. Input gases are controlled to the same pressure and mixed based on their volumetric flows.

**Adjustment of the flow rate**
Within the design limits, the desired flow rate can be set at LT GAS MIXER. This initially takes place via the metering valves of the individual gases and, in addition, via a dynamic pressure valve in the gas mixture outlet pipe.

The flow rate, which is displayed on the flow meters, is always provided in full by LT GAS MIXER, regardless of the set outlet pressure.

**Setting the mixing ratio**
The mixing ratio of the individual gases is set by the ratio of the respective volume flows. First, the desired volume flow of the carrier gas is adjusted via the corresponding metering valve. The flow meter for the carrier gas shows the volume flow. Then the volume flow of the admixing gas is adjusted with the corresponding valve and read on the flow meter.

LT GAS MIXER for flammable gases (GMB series), where an analyzer is usually installed, the proportion of admixed gas is adjusted via the gas metering valve. The ratio is displayed in the display of the gas analyzer.

To support the setting, please download a free app in the Android and Apple app stores. That's why each gas blender gets a sticker from which the QR code can be scanned:
Clocked gas mixture production
The pressure of the gas mixture is controlled by an adjustable pressure switch. These are used to set limit values for the desired switch-on and switch-off pressure ("hysteresis"). The pressure is read in the pressure gauge provided for this purpose.

With gas mixture consumption, the pressure drops. As soon as this pressure reaches the set lower limit value (= lower switching point), the gas mixer switches on automatically until the pressure reaches the upper limit value (= upper switching point).

With continued gas mixture consumption, the switch-on and switch-off process is repeated accordingly. The operation of the gas mixer is clocked, in particular with discontinuous gas mixture consumption. This is equalized by a suitable buffer.

Inquiring the perfect suiting LT GAS MIXER

To enable us quoting you the perfect suiting gas mixer, we ask for some information. To make it as easy as possible for you, please fill out the prepared online form:

For the short request mostly the short form with only 10 questions is sufficient. With this you can select the right gas mixer in a few steps and receive your individual offer immediately.

If you have more information on more complex tasks, please use the detailed form.

Choosing the right gas mixer with a few steps
Your specification, our solutions

- Delivered gas mixer from a few l/Min up to 10,000 Nm³/h
- Gas mixer for 2 to 20 gases for
  - toxic and poisonous gases
  - flammable and non-flammable gases
  - corrosive gases
- Redundant design with full automatic bump-free switch over

Advantages of LT GAS MIXER
Safe provision and full documentation of defined gas mixtures for your production with Industrial IoT suitable high-tech gas mixers:

- **Comfortable** and intuitively to operate
- Very **precise** gas mixture: 0.5% guaranteed repeatability
- **Automatic** restart after standstill
- Technically **tight** at permanence
- **High quality** and reliable fittings and components for demanding production environments
- **Robust** design, resistant to environmental influences
- **Easy** accessibility and maintenance
LT Gas Mixer type comfort without buffer vessel for flammable or non-flammable gases

- Gas mixer in field cabinet with lockable door with viewing window for wall mounting
- $p_1 = 12-25$ barg
- $p_2 = 2-8$ barg
- Maximal performance: 15, 25, 50, 100, 200 or 300 Nm³/h, indicated as maximum continuous gas mix production quantity
- Gas mix reproducibility ± 0.5 Vol%
- No dependency of gas mix quality from outlet pressure
- Gas mixer for 2 gases: 2 inlets, connection as clamping ring connection for pipe OD18mm
- Gas mixer for 3 gases: 3 inlets, connection as clamping ring connection for pipe OD18mm
- Gas filter in every gas inlet
- Integrated compensation of significant inlet pressure differences ($\geq 3$ bar), because in every gas inlet line one LTD-1 dome loaded pressure regulator homogenizes the gas pressures: Saving of further regulators including their fittings
- Variable-area flowmeter and pressure gauge
- 1 outlet connection as clamping ring connection for pipe OD18mm
- Without buffer vessel
- Mixing ratio adjustable
- All pressurized metallic components suitable for -196°C
- All gas-carrying pipes in copper
- Reliability: Automatic shut-off the admixing gas on carrier gas failure
- Suitable for indoor and outdoor installations
- Without gas analysis
- Conformity declaration pressure equipment (PED)
- TÜV conformity declaration (PED) module G
- Packaging
- Operating manual in printed version and on CD
- Dimensions WxHxD 800x1000x400 mm
- Weight approx. 100 kg

All details without possible options.

| Gas Mixer for 2 non-flammable gases - without buffer vessel |
|-----------------|-----------------|-----------------|-----------------|
| 15 Nm³/h        | GM-15-2-comfort  | 2-0015          |
| 25 Nm³/h        | GM-25-2-comfort  | 2-0025          |
| 50 Nm³/h        | GM-50-2-comfort  | 2-0050          |
| 100 Nm³/h       | GM-100-2-comfort | 2-0100          |
| 200 Nm³/h       | GM-200-2-comfort | 2-0150          |
| 300 Nm³/h       | GM-300-2-comfort | 2-0250          |

| Gas Mixer for 3 non-flammable gases - without buffer vessel |
|-----------------|-----------------|-----------------|-----------------|
| 15 Nm³/h        | GM-15-3 comfort  | 2-0150          |
| 25 Nm³/h        | GM-25-3 comfort  | 2-2250          |
| 50 Nm³/h        | GM-50-3 comfort  | 2-0500          |
| 100 Nm³/h       | GM-100-3 comfort | 2-0300          |
| 200 Nm³/h       | GM-200-3 comfort | 2-0410          |
| 300 Nm³/h       | GM-300-3 comfort | 2-0710          |

| Gas Mixer for 2 flammable gases - ohne Pufferbehälter |
|-----------------|-----------------|-----------------|-----------------|
| 15 Nm³/h        | GMB-15-2-comfort | 2-0017          |
| 25 Nm³/h        | GMB-25-2-comfort | 2-0027          |
| 50 Nm³/h        | GMB-50-2-comfort | 2-0052          |
| 100 Nm³/h       | GMB-100-2-comfort| 2-0120          |
| 200 Nm³/h       | GMB-200-2-comfort| 2-0420          |
| 300 Nm³/h       | GMB-300-2-comfort| 2-0720          |

| Gas Mixer for 3 flammable gases - ohne Pufferbehälter |
|-----------------|-----------------|-----------------|-----------------|
| 15 Nm³/h        | GMB-15-3 comfort | 2-0023          |
| 25 Nm³/h        | GMB-25-3 comfort | 2-0028          |
| 50 Nm³/h        | GMB-50-3 comfort | 2-0053          |
| 100 Nm³/h       | GMB-100-3 comfort| 2-0130          |
| 200 Nm³/h       | GMB-200-3 comfort| 2-0430          |
| 300 Nm³/h       | GMB-300-3 comfort| 2-0730          |
LT Gas Mixer type comfort with 90 liter, 25 bar SS buffer-vessel for flammable or non-flammable gases

- Gas Mixer in a field cabinet with lockable glassed door for location on the floor
- $p_1=12\text{--}25$ barg
- $p_2=2\text{--}8$ barg
- Maximal performance: 15, 25, 50, 100, 200 or 300 Nm³/h, indicated as maximum continuous gas mix production quantity
- Gas mix reproducibility $\pm 0.5$ Vol\%
- No dependency of gas mix quality from outlet pressure
- Integrated buffer vessel: Vessel 90 Liter, stainless steel, 25 bar; other vessels upon request
- With safety relief valve 25 bar and blow off pipe incl. valves
- Buffer bypass pipe incl. valves
- Gas mixer for 2 gases: 2 inlets, connection as clamping ring connection for pipe OD18mm
- Gas mixer for 3 gases: 3 inlets, connection as clamping ring connection for pipe OD18mm
- Gas filter in every gas inlet
- Integrated compensation of significant inlet pressure differences ($\geq 3$ bar), because in every gas inlet line one LTD-1 dome loaded pressure regulator homogenizes the gas pressures: Saving of further regulators including their fittings
- Variable-area flowmeter and pressure gauge
- 1 outlet connection as clamping ring connection for pipe OD18mm
- Mixing ratio adjustable
- All pressurized metallic components suitable for -196°C
- All gas-carrying pipes in copper
- Reliability: Automatic shut-off the admixing gas on carrier gas failure
- Suitable for indoor and outdoor installations
- Without gas analysis
- Conformity declaration EMV/low voltage directive
- Conformity declaration ATEX (in the EU necessary for flammable gases)
- Conformity declaration pressure equipment (PED)
- TÜV conformity declaration (PED) module G
- Packaging
- Operating manual in printed version and on CD
- Dimensions WxHxD 820x1700x510 mm
- Weight approx. 220 kg

All details without possible options.

| Gas Mixer for 2 non-flammable gases - with 90 Liter buffer vessel in stainless steel, 25 bar |
|---------------------------------|-----------------|------------------|
| 15 Nm³/h                       | GM-15-2-E-comfort | 2-3130           |
| 25 Nm³/h                       | GM-25-2-E-comfort | 2-3230           |
| 50 Nm³/h                       | GM-50-2-E-comfort | 2-3330           |
| 100 Nm³/h                      | GM-100-2-E-comfort | 2-3530         |
| 200 Nm³/h                      | GM-200-2-E-comfort | 2-3630         |
| 300 Nm³/h                      | GM-300-2-E-comfort | 2-3730         |

| Gas Mixer for 3 non-flammable gases - with 90 Liter buffer vessel in stainless steel, 25 bar |
|---------------------------------|-----------------|------------------|
| 15 Nm³/h                       | GM-15-3-E-comfort | 2-3135           |
| 25 Nm³/h                       | GM-25-3-E-comfort | 2-3235           |
| 50 Nm³/h                       | GM-50-3-E-comfort | 2-3335           |
| 100 Nm³/h                      | GM-100-3-E-comfort | 2-3535         |
| 200 Nm³/h                      | GM-200-3-E-comfort | 2-3635         |
| 300 Nm³/h                      | GM-300-3-E-comfort | 2-3735         |

| Gas Mixer for 2 flammable gases - with 90 Liter buffer vessel in stainless steel, 25 bar |
|---------------------------------|-----------------|------------------|
| 15 Nm³/h                       | GMB-15-2-E-comfort | 2-3140           |
| 25 Nm³/h                       | GMB-25-2-E-comfort | 2-3240           |
| 50 Nm³/h                       | GMB-50-2-E-comfort | 2-3340           |
| 100 Nm³/h                      | GMB-100-2-E-comfort | 2-3540         |
| 200 Nm³/h                      | GMB-200-2-E-comfort | 2-3640         |
| 300 Nm³/h                      | GMB-300-2-E-comfort | 2-3740         |

| Gas Mixer for 3 flammable gases - with 90 Liter buffer vessel in stainless steel, 25 bar |
|---------------------------------|-----------------|------------------|
| 15 Nm³/h                       | GMB-15-3-E-comfort | 2-3145           |
| 25 Nm³/h                       | GMB-25-3-E-comfort | 2-3245           |
| 50 Nm³/h                       | GMB-50-3-E-comfort | 2-3345           |
| 100 Nm³/h                      | GMB-100-3-E-comfort | 2-3545         |
| 200 Nm³/h                      | GMB-200-3-E-comfort | 2-3645         |
| 300 Nm³/h                      | GMB-300-3-E-comfort | 2-3745         |
Data Sheet LT Gas Mixer type smart

LT Gas Mixer type smart without buffer vessel for flammable or non-flammable gases

- Gas mixer in field cabinet for wall mounting
- $p_1=12-25$ barg
- $p_2=2-8$ barg
- Maximal performance: 15, 25, 50, 100, 200 or 300 Nm³/h, indicated as maximum continuous gas mix production quantity
- Gas mix reproducibility $\pm 0.5$ Vol%
- No dependency of gas mix quality from outlet pressure
- Gas mixer for 2 gases: 2 inlets, connection as clamping ring connection for pipe OD18mm
- Gas mixer for 3 gases: 3 inlets, connection as clamping ring connection for pipe OD18mm
- Integrated compensation of significant inlet pressure differences ($\geq 3$ bar), with one LTD-1 dome loaded pressure regulator in every gas line: Saving of further regulators including their fittings
- Variable-area flowmeter and pressure gauge
- One outlet connection as clamping ring connection for pipe OD18mm
- Without buffer vessel
- Mixing ratio adjustable
- Visual display of op. parameters integrated for pressure and volume flow
- Pressurized metallic components with verified low-temperature toughness
- All gas-carrying pipes in copper
- Reliability: Automatic shut-off the admixing gas on carrier gas failure
- Suitable for indoor and outdoor installations
- Without gas analysis
- Dimensions WxHxD 800x1000x400 mm
- Weight approx. 100 kg

**Gas Mixer for 2 non-flammable gases - without buffer vessel**

<table>
<thead>
<tr>
<th>Nm³/h</th>
<th>Model</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>GM-15-2-smart</td>
<td>2.5110</td>
</tr>
<tr>
<td>50</td>
<td>GM-50-2-smart</td>
<td>2.5310</td>
</tr>
<tr>
<td>100</td>
<td>GM-100-2-smart</td>
<td>2.5410</td>
</tr>
</tbody>
</table>

**Gas Mixer for 2 flammable gases - with 90 Liter buffer vessel in stainless steel, 10 bar**

<table>
<thead>
<tr>
<th>Nm³/h</th>
<th>Model</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>GMB-15-2-E-smart</td>
<td>2.5170</td>
</tr>
<tr>
<td>50</td>
<td>GMB-50-2-E-smart</td>
<td>2.5370</td>
</tr>
<tr>
<td>100</td>
<td>GMB-100-2-E-smart</td>
<td>2.5470</td>
</tr>
</tbody>
</table>

All details without possible options.
LT Gas Mixer type smart with 90 liter, 10 bar SS buffer-vessel
for flammable or non-flammable gases

- Gas mixer in field cabinet for location on the floor
- $p_1=12-25$ barg
- $p_2=2-8$ barg
- Maximal performance: 15, 25, 50, 100, 200 or 300 Nm$^3$/h, indicated as maximum continuous gas mix production quantity
- Gas mix reproducibility ± 0.5 Vol%
- No dependency of gas mix quality from outlet pressure
- Integrated buffer vessel: Vessel 90 Liter, stainless steel, 10 bar; other vessels upon request
- With safety relief valve 10 bar
- Gas mixer for 2 gases: 2 inlets, connection as clamping ring connection for pipe OD18mm
- Gas mixer for 3 gases: 3 inlets, connection as clamping ring connection for pipe OD18mm
- Integrated compensation of significant inlet pressure differences (≥ 3 bar), because in every gas inlet line one LTD-1 dome loaded pressure regulator homogenizes the gas pressures: Saving of further regulators including their fittings
- Variable-area flowmeter and pressure gauge
- 1 outlet connection as clamping ring connection for pipe OD18mm
- Mixing ratio adjustable
- Pressurized metallic components with verified low-temperature toughness
- All gas-carrying pipes in copper
- Reliability: Automatic shut-off the admixing gas on carrier gas failure
- Suitable for indoor and outdoor installations
- Without gas analysis
- Dimensions WxHxD 820x1700x510 mm
- Weight approx. 220 kg

All details without possible options.
Digitization in production: High-tech has a name for our gas mixers: LT Gas Mixer advanced

Performance classes
Serial models come in the following performance classes:

Non-flammable gases or MAP gases for food processes
- GM 25-2-A advanced 1 ... 25 Nm³/h
- GM 125-2-A advanced 25 ... 125 Nm³/h

Flammable Gases
- GMB 25-2-A advanced 1 ... 25 Nm³/h
- GMB 125-2-A advanced 25 ... 125 Nm³/h

In terms of prices LT Gas Mixer advanced are comparable with static Gas Mixer with buffer vessel and Gas-Analyser – please send us your individual data.

convenient – precise– high tech
Digital solution
Secure provision and complete documentation of defined gas mixtures for your production with high-tech gas mixers:

- **Convenient** and intuitive to operate via touch screen, connection to supervisory control system. Fully automatic control

- Bidirectional **data exchange** with higher-level systems (e.g., furnace control, process control system etc.) Interfaces: Ethernet, Modbus TCP/IP, Profibus, CANopen

- Very precise gas mixture: **0.2% guaranteed** repeatability

- **Gas analyzer included**: Reliable measurement precision
  Extractive continuous determination of combustible or non-combustible gas concentrations in gas mixtures

- Integrated **data logger** for documentation of inlet pressures, gas flow rates, gas analysis results. Data recording internally, data transferable to USB memory via USB interface on the front of the housing

- No additional software needed
### Essential differences between gas mixer concepts

**Static** (mechanical gas mixer) – LT Gas Mixer type smart or comfort  
**Dynamic** (MFC-based gas mixer) – LT Gas Mixer type advanced

<table>
<thead>
<tr>
<th></th>
<th>Gas Mixer static (smart or comfort)</th>
<th>Gas Mixer dynamic (advanced)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas mixture adjustment</td>
<td>Static gas mixer: Manual adjustment via metering valves, with manual data reading via manometer and flow meter</td>
<td>Adjustment electronically and reproducibly via local control unit as well as via data transfer e.g. from a central control system. Automatic compensation of pressure and temperature changes</td>
</tr>
<tr>
<td>Reproducibility *</td>
<td>+/- 0.5%</td>
<td>+/- 0.2%</td>
</tr>
<tr>
<td>Achievement of exactly the same gas mixture after changing the gas mixture setting</td>
<td>Accurate reproduction is not possible without downstream gas analyzer due to parallax errors and different metering valve settings by different thread flanks settings</td>
<td>Accurate reproduction is easily possible using electronic values</td>
</tr>
<tr>
<td>Documentation of gas mixture</td>
<td>Possible with manual writing, which is subject to parallax errors</td>
<td>Fully automatic documentation of the mass flow rates of the individual gases. Transfer of data via USB-Drive or interface for evaluation e.g. by Excel.</td>
</tr>
<tr>
<td>Gas mixture adjustment</td>
<td>Static gas mixer: Manual adjustment via metering valves, with manual data reading via manometer and flow meter</td>
<td>Adjustment electronically and reproducibly via local control unit as well as via data transfer e.g. from a central control system. Automatic compensation of pressure and temperature changes</td>
</tr>
</tbody>
</table>
| Special features               | - Long lasting  
                                  - Safe  
                                  - Easy to maintain                                                                 | - Adjustable on the integrated touch-screen -> Convenient and user-friendly  
                                  - Comprehensive documentation of the individual values -> Quality assurance  
                                  - Remote control -> Integration into higher-level control possible  
                                  - High accuracy -> Best gas mixture results  
                                  - More options -> Upgradable |

*Reproducibility is meant as a repeat deviation of the individual measurement from the respective reference measured value for the gas mixers offered here. This requires operation within the design limits, approximate temperature equilibrium of the gases, constant pressures, as well as a proper maintenance according to the technical and manufacturing regulations.*

Both gas mixer concepts have the possibility to **remotely switch on and off** the gas-withdrawal via solenoid valve.
Your specification, our solution

- Gas mixer delivered from few l/Min up to 10.000 Nm³/h
- Redundant design with full automatic bump free switch over
- Gas mixer for 2 up to 20 gases for
  - toxic and poisonous gases
  - fuel gases and non-flammable gases
  - corrosive gases

And of course we as well provide commissioning, training, service and maintenance!
Advantages of LT Gas Mixer type advanced
Convenient digital and precise gas mixers:

- Possibility to connect to a supervisory plant control system to automatically follow the specified values
- Automatic restart after Gas Mixing System shutdown
- No manual interventions on product changeovers (e.g. recipe control on specification from supervisory plant control system)
- Even without supervisory plant control system, full automatic functionality through local operating panel
- Only a dynamic (= fully automated) version ensures that the gas mixture quality continuously and precisely corresponds to the set points

Degree of automation ⇒ easy handling, precise mixture

Proven Design ⇒ Reliable, durable and easy to maintain

- Technically tight on permanence
- Use of reliable components for harsh production environments
- Very durable design, resistant to environmental influences
- Easy accessibility and maintenance
- Competent in gas mixing technology since 1971

Gas Mixer advanced for flammable gases
OPTIONS
FOR LT GAS MIXER

Overview

Options
beyond standards
Disturbances in the protective gas supply can cause production losses or affect product quality. In the worst case, it even can endanger life and health. LT GASETECHNIK offers the LT GasAnalyzer to permanently monitor the protective gas quality. This highly performant analyzer measures the concentration of technical gases based on a thermal conductivity sensor, an infrared sensor or a paramagnetic sensor. Combinations of these precise and robust sensors are as well possible.

Solution
Modular system including numerous built-in functions, and is upgradable with multiple options:

- Extractive online measurement of the concentration of combustible or non-combustible gas components in gas mixtures
- Response time
  - Thermal conductivity T<sub>90</sub> time < 2 seconds
  - Near infrared T<sub>90</sub> time < 15 seconds
- Fully automatic operation, with integrated PCS, expandable to be used for a measurement-guided control of devices, such as gas mixers.
- Operation easy and intuitive, connection to superordinate control system possible
- Reliable, highly sensitive and precise
- Low drift sensors w. low cross-sensitivity, for high long-term stability
- For documentation of a constant gas mix quality optionally with integrated data logger and automatic calibration, to ensure a constant gas mix quality
- Suitable for installation outside ex-zones
- Optional system, configured to your specifications

flexible – precise – modular
### Measured gases

#### 1. Thermal conductivity detector, standard gas combinations and ranges

<table>
<thead>
<tr>
<th>Measured gas</th>
<th>Carrier gas</th>
<th>Smallest range</th>
<th>Largest range</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂</td>
<td>N₂ or air</td>
<td>0 - 0,5 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>H₂</td>
<td>Ar</td>
<td>0 - 0,4 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>H₂</td>
<td>He</td>
<td>20 - 40 Vol.%</td>
<td>20 - 100 Vol.%</td>
</tr>
<tr>
<td>H₂</td>
<td>CH₄</td>
<td>0 - 0,5 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>H₂</td>
<td>CO₂</td>
<td>0 - 0,5 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>He</td>
<td>N₂ or air</td>
<td>0 - 0,8 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>CO₂</td>
<td>N₂ or air</td>
<td>0 - 3 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>CO₂</td>
<td>Ar</td>
<td>0 - 10 Vol.%</td>
<td>40 - 100 Vol.%</td>
</tr>
<tr>
<td>Ar</td>
<td>N₂ or air</td>
<td>0 - 3 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>Ar</td>
<td>CO₂</td>
<td>-</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>CH₄</td>
<td>N₂ or air</td>
<td>0 - 2 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>CH₄</td>
<td>Ar</td>
<td>0 - 1,5 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>O₂</td>
<td>N₂</td>
<td>0 - 15 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>O₂</td>
<td>Ar</td>
<td>0 - 2 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>N₂</td>
<td>Ar</td>
<td>0 - 3 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>N₂</td>
<td>CO₂</td>
<td>0 - 4 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>NH₃</td>
<td>H₂</td>
<td>0 - 5 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>NH₃</td>
<td>N₂</td>
<td>0 - 10 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>CO</td>
<td>H₂</td>
<td>0 - 2 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
<tr>
<td>SF₆</td>
<td>N₂ or air</td>
<td>0 - 2 Vol.%</td>
<td>0 - 100 Vol.%</td>
</tr>
</tbody>
</table>

Note: The measurement of CO₂ content with the thermal conductivity detector is possible, but the repeatability is not stable, so we recommend choosing an infrared sensor.

#### 2. Infrared sensor, standard gases and ranges

<table>
<thead>
<tr>
<th></th>
<th>Smallest range</th>
<th>Largest range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0 to 1000 Vol.ppm</td>
<td>0 to 100 Vol.%</td>
</tr>
<tr>
<td>CO₂</td>
<td>0 to 30 Vol.ppm</td>
<td>0 to 100 Vol.%</td>
</tr>
<tr>
<td>CH₄</td>
<td>0 to 5 Vol.%</td>
<td>0 to 100 Vol.%</td>
</tr>
<tr>
<td>NO</td>
<td>0 to 3000 Vol.ppm</td>
<td>0 to 4 Vol.%</td>
</tr>
<tr>
<td>SO₂</td>
<td>0 to 1000 Vol.ppm</td>
<td>0 to 1 Vol.%</td>
</tr>
<tr>
<td>NH₃</td>
<td>0 to 20 Vol.ppm</td>
<td></td>
</tr>
<tr>
<td>CF₄</td>
<td>0 to 2000 Vol.ppm</td>
<td></td>
</tr>
</tbody>
</table>

#### 3. Paramagnetic Sensor, ranges

<table>
<thead>
<tr>
<th></th>
<th>Smallest range</th>
<th>Largest range</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₂</td>
<td>0 to 10 Vol.%</td>
<td>0 to 100 Vol.%</td>
</tr>
</tbody>
</table>
**Design**

Versatile analysis system with convenient features:

![Image of a gas analysis system](image)

**Convenient Features**

- PLC Controller with integrated 6" color-TFT touch screen
- Interfaces: USB A and B, 10/100 Ethernet, 2 serial Ports (RS232 and RS 485), Modbus RTU, CANOpen
- 12x digital inputs (12V/24VDC) for processing external signals like eg. confirmation or start calibration), of this 4 usable as 10 kHz quick counter
- 6x relays outputs- up to 5A total current, for eg. gas mixer switch over or control of a solenoid valve for fuel gas flow switch off
- 4x 10-bit analogue input for 0-10V and 4-20mA, eg. for protocolling optional sensors like gas-pressure and gas-flow
- Sample gas up to. 10 barg, max. 40°C, throughput approx. 1 l/min
- Status messages (limits and failures) in the display, which are also provided via two potential-free contacts on terminals, eg. for transfer to the control system or for indication by a stack lamp
- Logging of gas analysis value (up to one year), for analysis with eg. Excel
- No additional software necessary
**Operation and communication**

- Easy and intuitive operation via 6” touchscreen
- Modern graphic color display
- Password protected program access
- Exhaustive self-diagnostic functions with messaging
- Multilanguage (currently DE, EN, FR, ES)
- Ethernet interface for remote-access or data-transfer
- Open interface architecture
- Integrated PLC control eg. for plant-control, switching of gas mixers or switching to backup systems. Development of customer specific solutions and programs for individual applications is possible

**Options only in combination with LT gas mixers:**

1. Integration into gas mixer (steel with lockable glassed door)
2. Gas sampling: Gas pipes and gas connections, monitoring of gas pressure and flow, 5-2-way valve for switching for calibration purposes between measured gas, zero gas and calibration gas
3. Automatic calibration with additional solenoid valves incl. control for automatic switching between measured gas, zero gas and calibration gas
Further options

1. One analogue output for each sample gas component
2. Customized integration into plant remote monitoring systems (telemetry) via Modbus TCP / IP, Profibus, CANopen, Ethernet, 4-20 mA, Web Server, FTP Host
3. Automatic switch-over between gas mixers, or to backup system
4. Control of an solenoid valve for shutting-off fuel gas flow
5. Upgrade for outdoor erection
6. Installation in a steel case (600 x 600 x 210 mm) with lockable glass door for wall mounting
7. LED lights with horn stack, for status indication
8. GSM module for **E-Mail dispatch** or SMS dispatch at defined situations
9. Temporary online customer support via **remote support** with ID and one-time password also behind firewalls, eg. to help with troubleshooting
10. Separate printer for documentation of measuring results
11. Redundant System to increase the availability
12. One LT GasAnalyzer to monitor two gas mixers
Buffer vessels

Buffer vessel designs

LT GASETECHNIK offers buffer vessels in the following standard versions:

<table>
<thead>
<tr>
<th>Volume</th>
<th>Pressure</th>
<th>Material</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>10 or 25</td>
<td>Stainless steel</td>
<td>Horizontal</td>
</tr>
<tr>
<td>250</td>
<td>16</td>
<td>Steel or stainless steel</td>
<td>Standing or horizontal</td>
</tr>
<tr>
<td>500</td>
<td>16</td>
<td>Steel or stainless steel</td>
<td>Standing or horizontal</td>
</tr>
<tr>
<td>1.000</td>
<td>10 or 16</td>
<td>Steel or stainless steel</td>
<td>Standing or horizontal</td>
</tr>
</tbody>
</table>

Examples of versions:

90 L, 25 bar, SS, horizontal

500 L, 16 bar, SS, standing

1.000 L, 10 bar, SS, standing

500 L, 16 bar, SS,
**Buffer vessel in the gas mixer cabinet**

If you opt for a LT gas mixer up to 200 Nm³/h from the smart or comfort series with buffer tank, the 90 liter buffer tank is installed horizontally on the bottom of the gas mixer cabinet.

The buffer vessel is *integrated* in the gas mixing system so that interfaces with the gas mixer are eliminated.

**Material**

The buffer vessel for the LT GASMISCHER types smart and comfort is made of *stainless steel*. This prevents possible damage if, in the event of a fault, cryogenic gas of up to -196°C breaks through from the gas source and enters the buffer vessel.
Bypass

The buffer vessel is equipped with a full-size bypass: To facilitate the prescribed regular inspections and to avoid downtime, the buffer vessel is equipped with a bypass. During the inspection of the buffer tank, the gas mixture can flow through the bypass and the gas mixer needs not be taken out of service during this time.

In addition, regardless of the gas mixture in the buffer vessel, a precise gas analysis of the flowing gas mixture and adjustment of the gas mixer can be made. This is especially helpful when starting up and changing the gas mixture.

Blow-off pipe

If necessary, gas stored in the buffer tank can be drained via the blow-off pipe. This allows the commissioning of the gas mixer independent of the consumer. Later, only the output ball valve needs to be switched and the gas mixture flows to the consumer.

Equipment

Of course, the buffer vessel is equipped with all necessary 
shut-off valves and an adapted safety valve.
Gax pipes, screwings
Process pipes to the buffer vessel are made exclusively in copper. All connections are brazed or designed as high-quality compression fittings in brass or stainless steel.

Setting the pressure in the buffer vessel
The gas mixture is consumed from the buffer vessel with the pressure prevailing there. The pressure of the gas mixture in the buffer vessel is controlled by an adjustable, electro-pneumatically actuated pressure switch. These are used to set limit values for the desired switch-on and switch-off pressure ("hysteresis"). The pressure is read in the manometer provided.

When gas mixture is withdrawn, the pressure in the buffer tank drops. As soon as this pressure reaches the set lower limit value (= lower switching point), the gas mixer automatically switches on and the buffer tank is filled with the gas mixture. The gas mixer automatically switches off again as soon as the pressure in the buffer tank reaches the set upper limit value (= upper switching point).

With continued gas mixture removal, the switching on and off is repeated accordingly. Thus the operation of the gas mixer is clocked, especially during discontinuous gas mixture consumption.
Necessary buffer volume

The required buffer volume depends on several factors:

- Existing buffer volume behind the gas mixer to the point of consumption (pipelines)
- Mixed gas consumption fluctuation in frequency and amplitude
- Pressure difference between lower and upper switching point of the gas mixer
- Mixing time for the gas mixer – recommended >2 seconds

Very simply simplifying and as a rough rule of thumb for a "correct buffer volume", 10% more buffer volume in liters than gas mixer capacity in Nm³/h. this under the boundary conditions dp=0.5 and mixing time>= 2 sec. In addition, certain standard sizes have been established, which also depend on the size of the torispherical heads.

Our process engineers will gladly assist you with the definition.

Sizes adapted to your needs
Industrial Internet of Things

The digitization of industrial production is making rapid progress. We offer a multitude of useful industrial IoT functions for LT Gas Mixers or Gas Mixing Plants with control system or with LT GasAnalyzer:

**IoT options in the control system**
- PLC Controller with integrated 6" color-TFT touch screen
- Status messages (limits and failures) in the display, which are also provided via two potential-free contacts on terminals, eg. for transfer to the control system or for indication by a stack lamp
- Digital inputs (12V/24VDC) for processing external signals like eg. confirmation or start calibration
- Relays outputs - up to 5A total current, for eg. gas mixer switch over or control of valves
- 10-bit analogue input for 0-10V and 4-20mA, eg. for protocolling optional sensors like gas-pressure and gas-flow
- Upgrade for outdoor erection

**IoT options for communication**
- Customized integration into plant remote monitoring systems (telemetry) via
  - USB A or B
  - 10/100 Ethernet
  - RS232 and RS485
  - Modbus RTU
  - CANOpen
  - TCP/IP
  - Optional Profibus, Profinet
- Own homepage via web server or FTP-host
- USB-connection for data recording – data analysis eg. in Excel
- Integrated GSM module for Internet with E-Mail dispatch or SMS dispatch at defined situations
- VPN-module for temporary online customer support via remote support with ID and one-time password also behind firewalls, eg. to help with troubleshooting

**IoT ready – we support the integration**
Gas mixer switch-over for the uninterrupted supply with mixed gas.

**Solution**

Switching to standby gas mixer and/or to emergency supply (bundle / bottle). Time-controlled or event-controlled automatic change. Expandable by (redundant) gas analysis and many IOT options.

- Convenient and intuitive to operate, connection to higher-level systems possible
- On error automatic switch-over to standby gas mixer
- Switch-over to emergency supply (bottles / bundles)
- After restart, operation with the last selected supplier
- Integrated control system with adjustable time slice (parameterizable via touch-screen) for consistent usage
- Status display of the active gas mixer
- Optical and acoustic alarm can be connected
- Password protected program access
- Development of customized programs and customizations for individual applications is possible
- Ready equipped and tested for easy on-site assembly
Options
The adaptation of the basic configuration to your individual needs is our special strength. The following options are executed on a regular base:

- LT GasAnalyzer
- Activation of both gas mixers at high gas consumption (additional pressure transmitters necessary)
- Switch over to stand-by gas mixer on full automatic calibration of LT GasAnalyzer
- Control of ex-approved devices
- LED lights with horn stack, for status indication
- External acknowledgment button
- Fittings for the exact configuration of automatic switching
- Customized integration into plant remote monitoring systems (telemetry) via Modbus TCP/IP, Profinet, CANopen, Ethernet, 4-20 mA, Web Server, FTP Host
- Control of ex-solenoid valve in the gas mixer for fuel gas shut-off
- Upgrading for outdoor installation
- GSM module for E-Mail dispatch or SMS dispatch at defined situations
- Ethernet interface for remote-access or data-transfer
- Temporary online customer support via remote support with ID and one-time password also behind firewalls, e.g. to help with troubleshooting
- Redundant System to increase the availability
Gas Mixer Options

Remote Support
Temporary online customer support via remote support with ID and one-time password also behind firewalls, eg. to help with troubleshooting

LT GasAnalyzer automatic zero-point calibration
Recommended equipment for gas analysers because otherwise the zero point drift should be corrected manually once a month. The automatic zero-point calibration supplies the measuring sensor with neutral gas (usually carrier gas), which allows the sensor to correct the drift. Consists of sample gas preparation, additional switching valve and software package in the gas analyzer.

LT GasAnalyzer semi-automatic end-point calibration
Calibration for drift compensation through exact adjustment of the sensor to the calibration gas value. The respective calibration is initialized by the operator manually by push-button and then executed automatically. It consists of sample gas preparation, additional switching valves and software package in the gas analyzer. Only in conjunction with zero point calibration, which is then also carried out semi-automatically.

LT GasAnalyzer full-automatic end-point calibration
Fully automatic zero-point and end-point calibration for drift correction by exact adjustment of the measuring sensor to the output and calibration gas value. The calibration is carried out automatically in individually adjustable clocking. It consists of sample gas preparation, additional switching valves and software package in the gas analyzer. Only in conjunction with zero point calibration, which is then also carried out automatically.
Integrated inlet and outlet pressure monitoring
Gas mixers with gas analyzer or gas mixer type advanced can be upgraded with an integrated inlet and outlet pressure monitoring. By controlling the gas pressures at the inlet and at the outlet of the gas mixer, an early warning is released in the event of faults in the clean gas or mixed gas supply. A loss in production can then be avoided eg. by switching over to an emergency-supply.

Equipped with
- Monitoring of up to 4 pressure transmitters eg. for
  - Input gases 1 and 2
  - Gas mixture outlet gas mixer
  - Pressure of emergency supply
- Freely adjustable limits
- Lamp with horn for status signaling

Separate inlet and outlet pressure monitoring
Gas mixers without gas analyzer or control system can be equipped with a separate LT Pressure Monitoring. By controlling the gas pressures at the inlet and at the outlet of the gas mixer, an early warning is released in the event of faults in the clean gas or mixed gas supply. A loss in production can then be avoided eg. by switching over to an emergency-supply

Modular system built in its own field cabinet, with many integrated functions, expandable by individual options:

**Integrated functions:**
- Full automatic operation, with integrated SPS
- Monitoring of up to 4 pressure transmitters eg. for
  - Input gases 1 and 2
  - Gas mixture outlet gas mixer
  - Pressure of emergency supply
- Freely adjustable limits
- Lamp with horn for status signaling
- Operation easy and intuitive, connection to superordinate control system possible
- For documentation with integrated data logger
Optional functions:

- For flammable gases, suitable for installation outside ex-zones
- Optional system, configured to your specifications
- Customized integration into plant remote monitoring systems (telemetry) via Modbus TCP / IP, Profibus, CANopen, Ethernet, 4-20 mA, Web Server, FTP Host
- Upgrade for outdoor erection
- LED lights with horn stack, for status indication
- GSM module for **E-Mail dispatch** or SMS dispatch at defined situations

Pre-configured exchange PLC

In order to meet the demands for reliability, a replacement PLC can be made available as back-up. This is factory-prepared so that it can be replaced with a few simple steps against the built-in PLC.

Stainless steel

On request, all parts of the gas mixer coming into contact with the media can be made of stainless steel. Stainless steel field cabinets are also optionally available.

Larger Display

For perfect usability, we recommend a robust and easy-to-read 6 "color display (left example picture). The standard equipment is a 4 "color display (right sample picture).
Other options
Upon request we offer several further options:

- Customized integration into plant remote monitoring systems (telemetry) via Modbus TCP / IP, Profibus, CANopen, Ethernet, 4-20 mA, Web Server, FTP Host
- Automatic switch-over between gas mixers, or to backup system
- Upgrade for outdoor erection
- LED lights with horn stack, for status indication
- GSM module for E-Mail dispatch or SMS dispatch at defined situations
- Redundant System to increase the availability

Packaging and shipping
Of course, we are happy to offer you cost for packaging and shipping to the destination you have named. The packaging is - depending on size - usually on a wooden pallet with protective foil. Seaworthy packaging and packaging in wooden box are also available.

Assembly, commissioning, training, optimization, maintenance, periodic inspection, disposal
This work during the life cycle of a gas mixer, we offer against lump sum or at cost.
Options for increasing the availability

Availability of a system often has a financial impact. This is made up of the costs for production downtime and troubleshooting. The assessment of the likelihood of error leads to the taking of measures to avoid errors and to preventively increase the technical reliability. In the context of the analysis of potential causes of errors and error frequencies in the supply with gas mixture, experience has shown that the following components should be analysed more detailed:

1. Carrier gas supply fails
2. Additive gas supply fails
3. Pure gas tank is empty
4. Gas mixing plant fails

Typically a single gas supply system is responsible for multiple production facilities. This can lead to bottlenecks, such that a failure of this system has significant impact on the availability of the production facilities.

The following concepts are used by default in the industry:

- Bypass
- Backup
- Redundancy

LT GASETECHNIK offers solutions that can be combined with each other for these three concepts, thus making it possible to increase the technical reliability in line with the probably avoided error costs.

Graduated combinable concepts – according to your budget
Bypass
On a fault in the gas supply or in the gas mixture generation, a full automatic switch-over to the bypass takes place (eg bypass with carrier gas such as nitrogen or argon). This gas flow then protects the production until the disturbance is eliminated. The bypass can of course only work if the gas is available, so errors such as "pure gas supply fails" or "the tank is empty" are not the cause.

Backup
As a backup solution, the emergency supply of pre-mixed gases from bundles or bottles has been established: If the regular gas supply is disturbed it is automatically switched-over to an emergency supply with ready-mixed or pure carrier gas (eg nitrogen). Premixing of the desired gas mixture and storing it in a buffer tank is usually not economical because of the resulting gas pressures and the gas mixture volumes required by the production, but can also be taken into consideration in individual cases.

A price for switching to backup or emergency supply (bundle/bottle), consisting of software, solenoid valve, piping, integration in the system concept, is worked out individually.

This option can be combined with the option "redundant plant", described below. With this you will receive a gas mixer system with safety cascade function. The switchover would then take place according to the following system:

1. Failure supply of first gas mixer
2. Switch-over to second gas mixer
3. Failure supply of second gas mixer
4. Switch-over to emergency supply (bottle/bundle system)
Redundant system

Redundancy is achieved with two parallel systems or two systems in one setup (as a container, cabinet, rack ...). On an adjustable time slice, usually in a weekly change, it is automatically switched between the two systems (or gas mixing tracks) to ensure a steady utilization and at the same time the functioning of all components and fittings. On occasionally increased mixed gas demand, usually both systems can be operated in parallel.

The gas analysis system can also be redundant. Then a double analysis, i.e. with two independent measuring cells, is installed. Two sensors continuously determine the gas mixture concentration. Each measuring cell is responsible for one gas mixture, thus ensuring independent redundancy. The gas analysis system is supplied via solenoid valves with the measuring gas of the corresponding gas mixing plant/the gas mixing track monitored. During switching, the condition of a fault with priority switching is taken into account.

When implemented as a fully redundant system, all electrical and mechanical components are duplicated. This means that each piece of equipment can work independently on its own, regardless of the failure of the other piece of equipment. Switching-over takes place in case of failure to the standby gas mixer. This ensures a time-controlled and an event-controlled automatic change-over.

1. Switching on failure to the standby gas mixer
2. After switching-off, operation with the last selected supplier
3. Integrated control with adjustable time slice (parameterizable via touchscreen) for steady utilization
4. Status display of the active gas mixer
5. Visual and audible alarm

To further increase the availability the following options are possible in a redundant system:

- Switching to emergency supply (bottles / bundles)
- Activation of both gas mixers with high gas consumption (additional pressure transmitter required)
- Switch to standby gas mixer upon optional fully automatic calibration of a gas mixer
- For fault indication: horn and lamp, combination, for wall mounting
- External acknowledgment button
Uninterrupted power supply

An UPS provides a reliable uninterruptible power supply. The plant operation is not disturbed by a possible interruption of the power supply. The UPS is equipped with battery buffer, automatic voltage regulation, LC display and energy saving functions.
Life cycle

What happens after ordering the LT gas mixer? The following phases in the life cycle then usually take place:

**Phase 1: Assembly**

This first phase takes place in the factory of LT GASETECHNIK: Complete electrical and mechanical assembly, testing of leak tightness, function and quality

- without real gases
- without real gas quantities

If necessary: **Factory Acceptance Test** in our factory

**Phase 2: Commissioning**

This second phase takes place at the customer's plant at the site of the installation of the Gas Mixer.

Once the Gas Mixer has been delivered, installed and connected to all incoming and outgoing pipes, and electricity and gases are available at the Gas Mixer, we offer that a service person will arrive and start the operation. If a connection to a higher-level controller is desired (option), this would include the coordination of the interfaces and the data exchange with this control system.

Subsequently, a detailed instruction and training of the responsible operating staff should take place.

By the customer:

- Transfer of the Gas Mixer from the point of delivery to the installation site
- Provision of the installation site
- Installation of the system
- Connecting the power and data lines
- Piping and connection of the media supply and discharge lines
- Provisioning of gases and electricity
- Provision of calibration gases, if a gas analyser is part of the scope
By LT GASETECHNIK

- Check for leaks and function
- Commissioning of the system with real gas quantities
- Interlocking test
- Test of purging processes, if present test of bypass and backup lines
- Training of the employees in operation and control of the plant

Completion: **Commissioning protocol**, if necessary with residual points.

We recommend that the personnel, who will operate the Gas Mixer on a regular base, will be present during the commissioning. Detailed instructions are given after commissioning.

**Phase 3: Optimization**

Usually after a few weeks of operation of the Gas Mixer, alternatively directly after commissioning, if immediate control operation is started, the system should be optimized. Typically the following will be checked and optimized:

- Checking the control strategies, and optimizing the stability and speed of the control circuits based on the operating experience:
  - disturbance size changes,
  - ramps,
  - hysteresis,
  - limit values.
- Optimization transient processes, overshoot amount
- Influence of parameter changes

**Phase 4: Service and Maintenance**

To ensure adequate and long term functionality of the Gas Mixer, it should be subject to regular service and maintenance. We recommend once per year. Unless you prefer to take care of this using your own personnel, we are ready to carry out this service for you.

Work as listed in “Phase 3 Optimization”, plus

- Exchange filter elements
- Checking gas return valves
- Check flow meter to zero point
- Check for initiation of the pneumatic controllers and actuators
- Installation of maintenance sets for pressure regulators
Check input and output pressures, control pressures, control function, error analysis

- Test gas analyzer with calibration gas - (customer supplies calibration gases, only if a gas analyzer is part of the delivery)
- Check gas warning system (if part of the delivery)

In this context, it should be noted that the Gas Mixer can, in the absence of Gas Mixer or gas mixture redundancy, only be maintained at standstill.

Clear definition of the phases = Clear interfaces

Phase 5: Recurring test

According to the Industrial Safety Regulations, recurring tests are required by "qualified persons". This work scope can be carried out by LT GASETENIK on behalf of the operator. It is often documented as part of the maintenance and service work.

Phase 6: Disposal / Recycling

The disposal and recycling can be done by LT GASETENIK. Upon return, the devices are dismantled. The housing, electronic components and steel, copper or brass components are fed into the recycling cycle.
SEVERAL INFORMATION

Information
beyond standards
Design and assembly is accomplished under strict adherence to following rules. Equally, when operating the equipment the same rules should be duly observed:

Concerning design and composition (for putting on the market)

- Directive on protection against explosion
- Directive on pressure equipment (PED)
- Directive on machines
- Directive for low voltage equipment
- Directive for EMV
- European and national standards, in particular
  - DIN EN ISO 12100-1/2 Safety of machines
  - DIN EN 746 Industrial thermal process equipment
  - DIN EN 954 Safety related parts of control panels
  - DIN EN 1050 Guidelines for risk assessment

Concerning operation (for assembly, installation and operation)

- Directive on industrial safety, in particular
  - §14, 15, 16 Test of equipment in areas with risk of explosion
- Directive on industrial safety, in particular
  - Technical rules on vessels
  - Technical rules on pipes
  - Technical rules on gases
- Directive on accident prevention, in particular
  - DGUV 1 General instructions
  - DGUV 3 Electrical equipment and production facilities
  - DGUV R 500 part 2.26 Welding, soldering, cutting and related techniques
  - DGUV R 500 part 2.33 Gases
- BG-Directives
  - DGUV R 113-001 Rules for explosion prevention
  - BGI 518 or TO 23 Use of static gas alert equipment to prevent explosions
  - BGI 612 Hydrogen
All design and manufacturing is executed according to **ISO 9001:2015** and according to Pressure Equipment Directive according to §3, Abs.3 (“sound engineering practice (SEP)”). The factory pre-assembled parts of the system are thoroughly inspected before shipment for leak-tightness and functionality, including the control system (and, if necessary, the gas analyzer) in our house to ensure their perfect operation.

Example of an acceptance certificate based on an EC individual test (**module G**), **AD 2000**, here for a LT gas mixer type smart:

LT is authorized according to Directive 97/23/EC for internal production control with monitoring of acceptance (**module A1**).
HAZOP-Study

In line with a concept to prevent incidents, the legislative body requires operators of systems, subject to statutory order on hazardous incidents, to prepare a systematic analysis of hazard sources for the systems concerned. An established method governmentally acknowledged is the application of a HAZOP study (Hazard and Operability), in Germany also known as the PAAG procedure. In accordance with a specified scheme a team assumes operating modes for the existing or planned system which deviate from the nominal condition. The team also tests how these operating modes can be developed, which consequences they could have and which remedies are necessary, available or to be arranged.

We offer for systems produced by us this HAZOP Study. The result comprehension will be provided as HAZOP-Study on basis of the planning documents.

Hazop-Study or Hazop-Leader

For the generation of HAZOP-Studies for overall systems we offer as a service the provision of an external HAZOP-Leader. The HAZOP leader has a special position among the team members. The HAZOP leader chairs and coordinates the meetings, with the team working on the aforementioned scheme for the single components. The HAZOP leader consolidates the different points of view of various sectors of manufacturers and operators and ensures at the same time the compliance with the systematic approach which has made the HAZOP method as successful as it is now.

The exceptional position of the HAZOP leader calls for this function to be filled by independent expert:

- Preparation of the HAZOP study based on your planning documents
- Chair the HAZOP meetings with your team members
- Summary of the results of the meetings in an elaborated study
- Assistance of your employees with the implementation of the specified measures
# Improvable designs

In practice, the LT team of process engineers, C&I engineers and our commissioning engineers have seen improvable designs of gas mixing and gas dosing systems. This comparison of design and construction between LT GASETECHNIKs gas mixing plants and gas mixing plants of other, less qualified, manufacturers shall stimulate critical assessment.

<table>
<thead>
<tr>
<th>Design by LT GASETECHNIK:</th>
<th>Found improvable designs of other manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to a special interlocking, the in-admissible accumulation of admixed gas is always excluded for LT gas mixers. The pressure regulators on the input tracks are pneumatically controlled by the carrier gas flow. On pressure drop of the carrier gas, the admixing gas is tracked proportionally. On total failure of the carrier gas, all gas tracks are shut-off. Additionally, the carrier gas controlled output valve is shut off. This prevents the occurrence of high additive concentrations. In addition, the gas analysis electrically locks an output valve. This provides a redundant safety lock.</td>
<td>Shut-off of the admixture gas only electrically controlled, without monitoring of the currently produced gas mixture. This design is safety-critical.</td>
</tr>
<tr>
<td>It is correct to regulate the gases to be mixed to an equal pressure (equal pressure method). As a result, the reproducibility of the desired gas mixture is achieved. The usage of dome loaded pressure regulators, whose dome chamber pressure is controlled by the same control pressure, ensures identical outlet pressures.</td>
<td>When using spring-loaded pressure reducers, no exact equal pressure is guaranteed. The control quality and thus the gas mixture composition is dependent on the spring force with respect to the current pressure difference.</td>
</tr>
<tr>
<td>From the Ex zone dependent, usage of the appropriate explosion protection measures e. g. at pressure switches, solenoid valves, compressors, etc.</td>
<td>Usage of ex-protected magnetic valves only in the fuel gas tracks instead of in all gas tracks. It is a misconception that explosion-proof solenoid valves are only approved for fuel gases. Usage of non-suitable compressors for flammable gases.</td>
</tr>
<tr>
<td>Safety Measure</td>
<td>Reason</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>To avoid embrittlement we completely avoid hoses. Process and control tracks are designed exclusively as high quality stainless steel or copper pipelines. These are hard brazed, welded or clamped and thus technically tight on permanence.</td>
<td>Hoses, used in fuel gas lines, become brittle over the time and thus impose the danger of fuel gas diffusion.</td>
</tr>
<tr>
<td>Monitoring of sensitive areas by gas warning sensor(s) (eg fuel gas, O2 or CO2 sensor) for personal protection.</td>
<td>Waiver of gas warning system at the cost of damage to the operating staff.</td>
</tr>
<tr>
<td>All initiators and switches in the Ex area are transferred to the safe area via disconnecting power amplifiers. Power supply only via ex-zone-compatible devices.</td>
<td>Use of explosion-proof solenoid valves, but no transport of the signals to the safe area via isolating switching amplifiers. Installation of unprotected power supply in the Ex area.</td>
</tr>
<tr>
<td>In each single gas line, check-valves are used to prevent gas transfer.</td>
<td>By waiving check-valves fuel gas at a higher pressure can mix with the carrier gas in the carrier gas line.</td>
</tr>
<tr>
<td>On generation of flammable gas mixtures, temperature monitoring of gas mixture tracks and redundant usage of flame arrestors in the pure gas tracks.</td>
<td>Waiver of safety-relevant design.</td>
</tr>
<tr>
<td>Observance of the technical rules of the Industrial Safety Rules, built to be “technically tight at permanence”.</td>
<td>Use of crimp connections for non-approved nominal diameters.</td>
</tr>
<tr>
<td>In the case of pressure step jumps, protection with individually designed safety valves.</td>
<td>Pressure step jumps without protection, thus waiving safety valves.</td>
</tr>
<tr>
<td>Individually selected, high-quality fittings with long service life, suitable for temperature and pressure range.</td>
<td>Use of equipment that is not suitable for the required pressure range or temperature range. Use of substandard equipment.</td>
</tr>
<tr>
<td>The set limit cannot be exceeded.</td>
<td>Flushing of kilns with non-inert gas mixtures with the consequence of deflagration.</td>
</tr>
</tbody>
</table>
In this brochure, we cannot show all of our piping and instrumentation diagrams, as you can select from 72 gas mixers models. In addition to these serial gas mixers, customer-specific solutions are our specialty. With every gas mixer you will of course receive a comprehensive documentation and an individual P&I diagram. For example, this can look like this:

Comprehensive documentation for safe operation
Part of the documentation is also the scale drawing ...

... and a comprehensive circuit diagram ...

... as well as the equipment list. This gives you complete information about the instruments used.

Depending on the individual version, the **customer documentation contains the following documents**:

1. Instructions
   1.1. Manual Gas Mixer
   1.2. Manual Gas Analyzer
2. Certificates LT GASETECHNIK
   2.1. EU Declaration LT GASETECHNIK
3. Technical drawings and lists
   3.1. Equipment list
   3.2. Piping and instrumentation diagram
   3.3. Scale drawing
4. Electric control
   4.1. EU certification of confirmation EMV
   4.2. Wiring diagram
   4.3. Proof of intrinsic safety
   4.4. Supplier certificates of purchased goods
5. Buffer vessel
   5.1. EU Certificate of Confirmation PED buffer vessel
   5.2. Manual buffer Vessel
6. Safety valve
   6.1. Manual for Safety Valve
   6.2. Certificate of Confirmation PED
Rates for Services

Validity: From January, 1\textsuperscript{st} 2018

For the supply of services LT GASETECHNIK will calculate the following hourly and daily rates:

<table>
<thead>
<tr>
<th>Service</th>
<th>Hourly rate/\textcurrency{}</th>
<th>Daily rate/\textcurrency{}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Manager/Engineer / Process Control</td>
<td>130</td>
<td>1300 €</td>
</tr>
<tr>
<td>System Specialist / Installation Supervisor</td>
<td>130</td>
<td>1300 €</td>
</tr>
<tr>
<td>Service Technician</td>
<td>95</td>
<td>950 €</td>
</tr>
<tr>
<td>Travel expenses car</td>
<td>0.75 €/km</td>
<td></td>
</tr>
</tbody>
</table>

All rates are based on five days per week (Monday – Friday) in single-shift operation (10 hours) without on-call personnel. If the work has to be executed outside of the normal working times – and if LT GASETECHNIK goes concern with this- overtime hours will be given a surcharge of 40%.

Work on weekends and holidays will be given the following surcharges
- up to 7.5 hours: plus 100%
- from 7.5 hours: plus 150%

On High Holidays (May Holiday, Easter, Pentecost, Christmas):
- up to 7.5 hours: plus 200%
- from 7.5 hours: plus 250%

If nights are required in this context, this will also be charged separately.

Billing for travel expenses at the maximum rates permitted by law. Travel time is billed as working time. Accommodation costs, air or rail costs according to receipt + 15% processing fee. Waiting periods which LT GASETECHNIK cannot be held responsible for will be financially covered at the expense of the customer.

Prices:
- Prices quoted do not include value-added tax.

Payment Terms:
- The total amount is due immediately upon receipt of invoice without deduction.

Generally services must be ordered in writing, stating the activities and estimated time required.

As you wish: Invoicing to actual expenses or lump sum
LT Gas Mixer are manufactured in Dortmund, Germany since 1971 – and we are proud of our further developments:

**1972** GM-50-2 welding gas mixer

**1979** GM-15-2 welding gas mixer

**1981** GM-50-2 welding gas mixer

**1989** GM-1-5 Ar/CO₂/O₂/H₂/He
1994 der erste LT GasAnalyzer

2009 2- and 3-gases mixer

2016 Gas mixer smart, comfort and advanced

Competent in gas mixing technology since 1971
Progress from tradition

2017
gas mixer advanced

2018
gas mixer advanced
About LT GASETECHNIK

Integrated in the weyer group and based in Dortmund, Germany since 1971, we develop and supply high-performance gas mixing equipment, serial gas mixers, serial valves and tailor-made control solutions. We manufacture standard equipment, as well as custom-designed systems with the highest standards of engineering, safety and quality. Complex technical requirements are at the same time for us stimulation and incentive – just beyond standards.

Our customers

We supply plants and fittings for a wide variety of industries and industrial applications. Our customers include not only all the world’s leading manufacturers of industrial gases, but also many companies from the following sectors:

- Machine and plant engineering
- Automotive industry
- Chemical industry
- Electronics, Measurement, Control and Analysis technology
- Ferrous / Non-Ferrous Metals
- Energy supply
- Liquefied gases
- Glass industry (float glass and flacons)
- High-tech industry
- Industrial gases
- Food industry
- Pharmaceutical industry

They all rely – typically since many decades - on our experience and our extensive and well-founded know-how. Our team of engineers from the fields of process engineering, design/planning and C&I-technology develops a practical and efficient solution in every single case, which, of course, also meets special requirements.
Member of the weyer group

LT GASETECHNIK is a member of the weyer group. Klaus Weyer is Managing Director at horst weyer and partner GmbH as well as at L+T GASETECHNIK Klöpper-Waldmann GmbH & Co. KG.

Overview of the weyer group:

- Founded 1976
- 4 countries
- 10 companies
- 17 sites
- More than 160 employees (plus employees of GASETECHNIK)
- More than 900 projects per year (plus LT GASETECHNIK projects)
- Customer industries: Chemical, Pharma, Oil, Supply and Disposal, as well as organizations and public authorities
- Services: Engineering and consulting in and around industrial plants
- Approx. 35 experts in the areas of waste, fire protection, explosion protection, immission control, water protection, business valuation, old loads, evaluation of machinery and industrial equipment, accident and radiation protection

LT GASETECHNIK – integrated in a strong group

The weyer group covers all aspects of engineering and consulting in the area of process and environmental technology. The team of experienced process engineers, natural scientists, process control technicians and business consultants develops, plans and implements individual projects in process and safety engineering and computer engineering. The extensive portfolio of the weyer group, thematic specializations on individual subject areas, references and information about the members of the weyer group can be found on www.weyer-gruppe.com
Supply range LT GASETECHNIK

Our supply range in an overview. Please contact us if you cannot find what you are looking for. We will be more than happy to work out your individual solution beyond standards together with you – just beyond standards:

Gas Process Plants
- Engineering, production and commissioning of Gas Mix, Gas Supply and Test Systems according to customer specifications
- Dynamic high-performance systems with associated electrical, measurement, control equipment and gas analysis systems.
- Customized Gas Process Plants

Gas Mixing Technology
- Gas mixer for flammable and non-combustible gases
- Static gas mixers with and without buffer vessel
- Dynamic, MFC-based, fully automated gas mixer
- Gas analysis systems

Gas related equipment
- Pressure regulators, pressure regulating stations and pressure control units
- Bottle and bundle battery systems
- Valves and gas filters
- Gas safety devices

E/C&I and analysis technology
- Individual solutions for control and regulation tasks
- Engineering, field cabinet design, PLC-software design
- Technical process engineering C&I
- Gas analyzers
- Standard equipment and systems for gas applications

Individually configurable – custom-fit for your needs
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Direct call: +49.231.961070-12