



LT GASETECHNIK
beyond standards



LT GAS MIXER OVERVIEW



Serial Gas Mixer

beyond standards



LT GASETECHNIK
beyond standards



Overview Serial Gas Mixer types

Gas Mixer
beyond standards



Comparison Gas Mixer types smart-comfort-advanced

Industrial

IoT

	Type smart	Type comfort	Type advanced
Max. performance gas mixture	15 Nm ³ /h 50 Nm ³ /h 100 Nm ³ /h	15 Nm ³ /h, 25 Nm ³ /h 50 Nm ³ /h, 100 Nm ³ /h 200 Nm ³ /h, 300 Nm ³ /h 500 Nm ³ /h, 1.000 Nm ³ /h	3 Nm ³ /h to 150 Nm ³ /h, customer specific other
Number of gases	2	2 or 3	2 to 3 (optionally more)
Types of gases	Technical gases, flammable and not flammable	Technical gases, flammable and not flammable	Technical gases, flamma- ble and not flammable toxic and corrosive gases
Media temper- atures	from -20 to +50°C	from -40 to +60°C	from -0 to +55°C (optionally -10 to +60°C)
Suitability	Cold resistant	To -196°C	Cold resistant
If equipped with buffer vessel	Stainless steel, 10 barg , clocked filling via pressure switch	Stainless steel, 25 barg clocked filling via pressure switch	Buffer vessel not neces- sary, adaptation to flow changes by mass flow controllers (MFC)
Gas mixture control	Static Gas Mixer: Ad- justing via dosing valves, data reading from pressure gauge and flow meter Accu- racy: +/- 0,5%	Static Gas Mixer: Ad- justing via dosing valves, data reading from pressure gauge and flow meter Accuracy: +/- 0,5%	Dynamic Gas Mixer: Adjustment electronically, reproducible via local op- erating unit. Automatic compensation of pressure and temperature changes Accuracy: +/- 0,2%
Special features	<ul style="list-style-type: none"> - Long living - Safe - Maintenance friendly - Max. outlet pres- sure 9 barg 	<ul style="list-style-type: none"> - Long living - Safe against cold gas break through - Maintenance friendly - Max. outlet pres- sure 22 barg 	<ul style="list-style-type: none"> - Control at integrated touch-screen - Gas-Analyzer for a small surcharge - Comprehensive docu- mentation of the indi- vidual values - A lot of IOT options - High accuracy - Small (600 x 400 x 1100 mm) - Max. outlet pressure 8 barg



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.



LT Gas Mixer Type comfort and smart

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: $\leq \pm 0.5 \text{ Vol\%}$ 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**

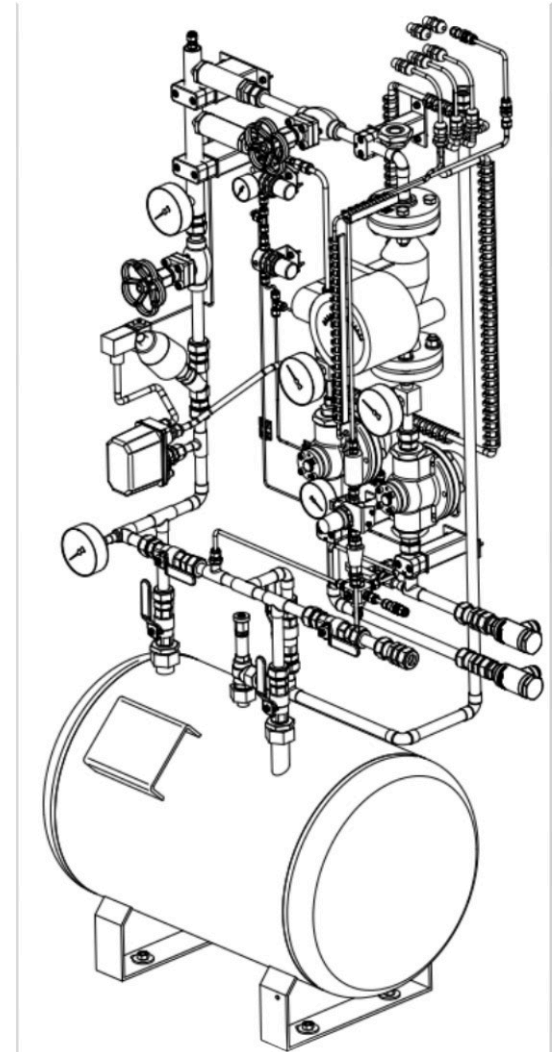
No universal valves: All metering and controlling valves used are tailored to each required flow capacity and are carefully selected. Only specific metering valves offer a sufficient degree of accuracy and comfort in the gas mixture setting. ⇒ **High accuracy**

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**



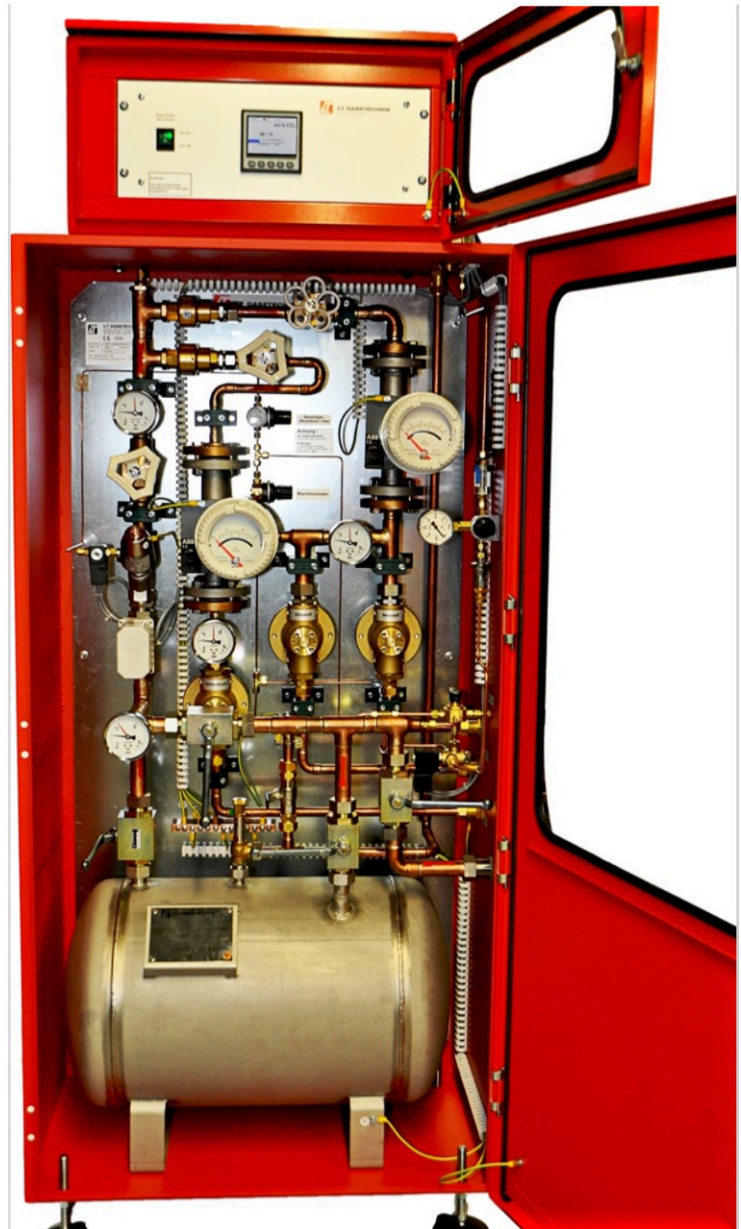
Customer specific solutions

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 from technical solution

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

Name	Cost	Explanation (in relation to LT Gas Mixers)
Gas filter		All supply lines include gas filters as standard
Pressure controller		All supply lines include dome loaded pressure controllers; there are no additional medium pressure controllers to install upstream.
Bypass buffer vessel		Useful for commissioning, inspection, adjustment
Blow off line Buffer vessel		Useful for commissioning to discharge gas mixture past the consumer
Complete documentation		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
USB-interface on the front of the housing front (of the gas analyser)		Competitor often calculate extra costs
Ethernet-interface (for the gas analyser)		Competitor often calculate extra costs
Data logging (in the gas analyser)		Competitor often calculate extra costs
Password protected touch screen (in the gas analyser)		Competitor often calculate extra costs
For Gas Mixers performing 100 Nm ³ /h and 200 Nm ³ /h a 90 l buffer vessel is sufficient		Competitor often offer larger buffer vessels
The number (15, 25, 50, etc.) at LT GAS MIXER stands for gas mixture performance in Nm ³ /h		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)



**Not clearly monetarily assessable advantages –
but valuable in a total cost of ownership review**

Maintenance	Easy accessibility of all fittings at LT-Gas mixers does not require "rubber hands with a surgeon's tool", thus significantly simpler and faster maintenance. Maintenance possible without dependence on the gas mixer manufacturer
Failure of fitting	Repair with standard components at delivery times <2 weeks No threat of long-term failure.
High mixing accuracy with large adjustment range	Guaranteed +/- 0,5 %; Is achieved by the dynamic control of the volume flow instead of static control by metering valve
No hoses	Technically tight on permanence
Visualizations of the gas flow	Fast troubleshooting through easy and permanent readability of 5 pressure gauges and 2 mass flow meters
Modular expandability / Upgradability	When changing the performance (eg from 50 to 100 Nm ³ / h) or of the mixing gases, often only one gas track has to be partially replaced, for very manageable costs
Long life	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!



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 Nm ³ /h
GM 25-2 comfort:	2 ... 25 Nm ³ /h
GM 50-2 comfort:	5 ... 50 Nm ³ /h
GM 100-2 comfort:	10 ... 100 Nm ³ /h
GM 200-2 comfort:	20 ... 200 Nm ³ /h
GM 300-2 comfort:	30 ... 300 Nm ³ /h
GM 500-2 comfort:	50 ... 500 Nm ³ /h
GM 1000-2 comfort:	100 ... 1000 Nm ³ /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 Nm ³ /h
	...to...
GM 1.000-3 comfort:	100 ... 1.000 Nm ³ /h

Flammable gases, for two gases,

as before, in the same performance classes:

GMB 15-2 comfort:	1 ... 15 Nm ³ /h
	...to...
GMB 1.000-2 comfort:	100 ... 1.000 Nm ³ /h

Flammable gases, for three gases,

as before, in the same performance classes:

GMB 15-3 comfort:	1 ... 15 Nm ³ /h
	...to...
GMB 1.000-3 comfort:	100 ... 1.000 Nm ³ /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 Nm ³ /h
GM 25-2 smart:	2 ...	25 Nm ³ /h
GM 50-2 smart:	5 ...	50 Nm ³ /h
GM 100-2 smart:	10 ...	100 Nm ³ /h

Flammable gases, for two gases,

as before, in the same performance classes:

GMB 15-2 smart:	1 ...	15 Nm ³ /h
	...to...	
GMB 200-2 smart:	20 ...	200 Nm ³ /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 Mixer 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

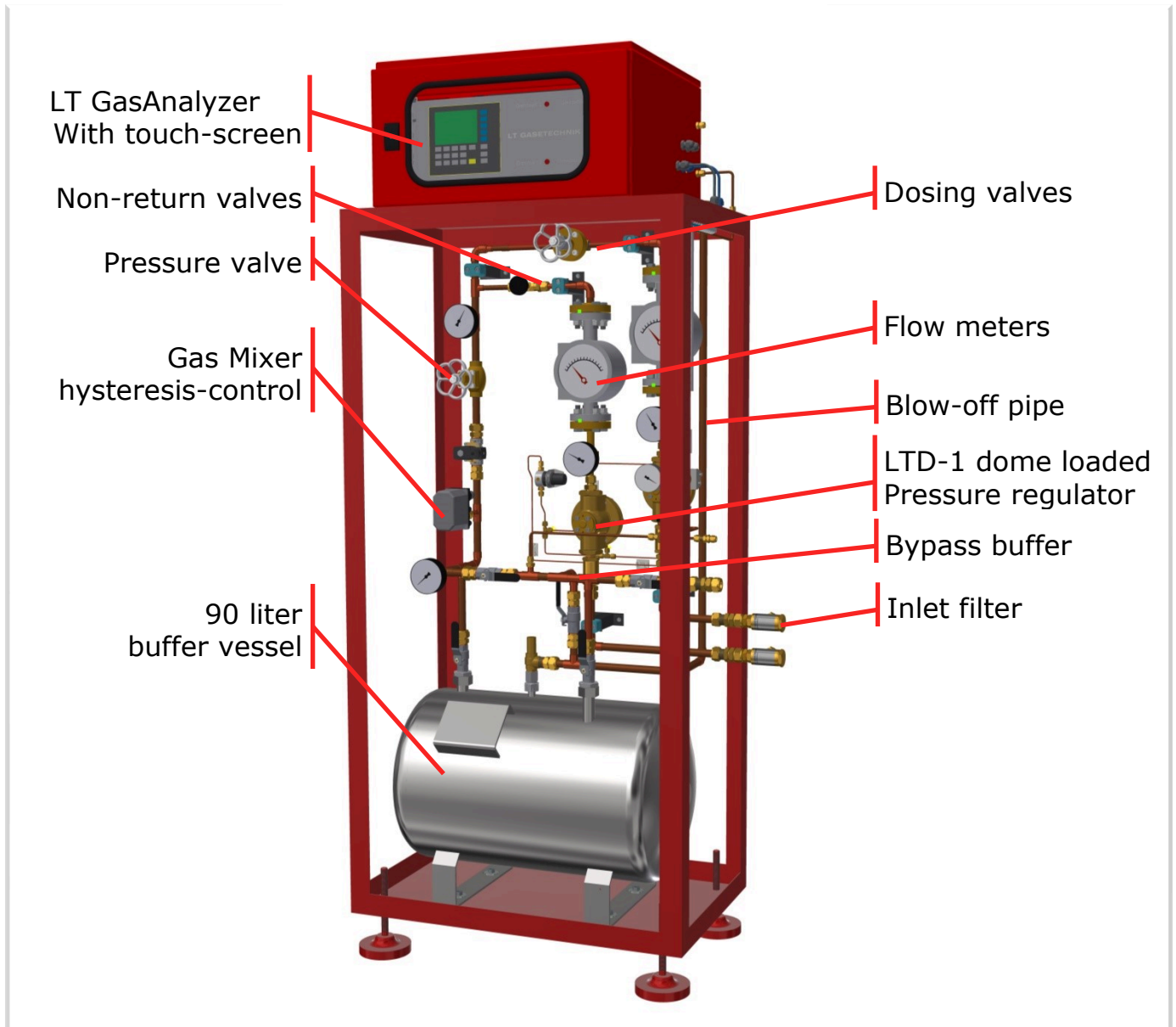
LT Gas Mixers are erected inside a lockable steel cabinet with a window in the front door.

Despite their compact structure, the layout is generous. This allows for perfect access during installation and service.



Gas Mixer for 3 gases
without buffer vessel

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.



Competence in gas mixing technology since 1971

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.





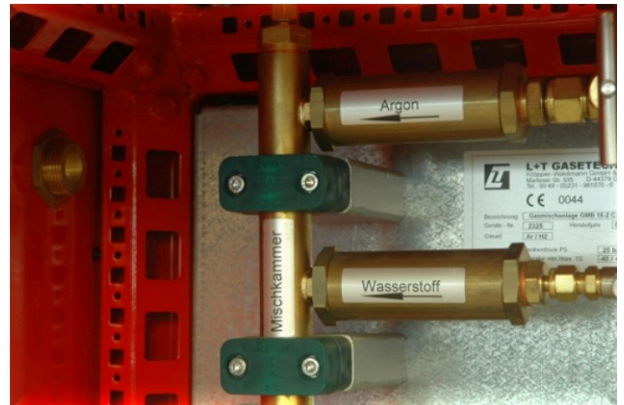
Dosing valves

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.

Many options available

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 Nm ³ /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 Nm ³ /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:



APP-DOWNLOAD

Einscannen + kostenlose App zur Berechnung
der Gasgemisch-Einstellung herunterladen!



... oder im Store suchen nach „Gasgemisch“!



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

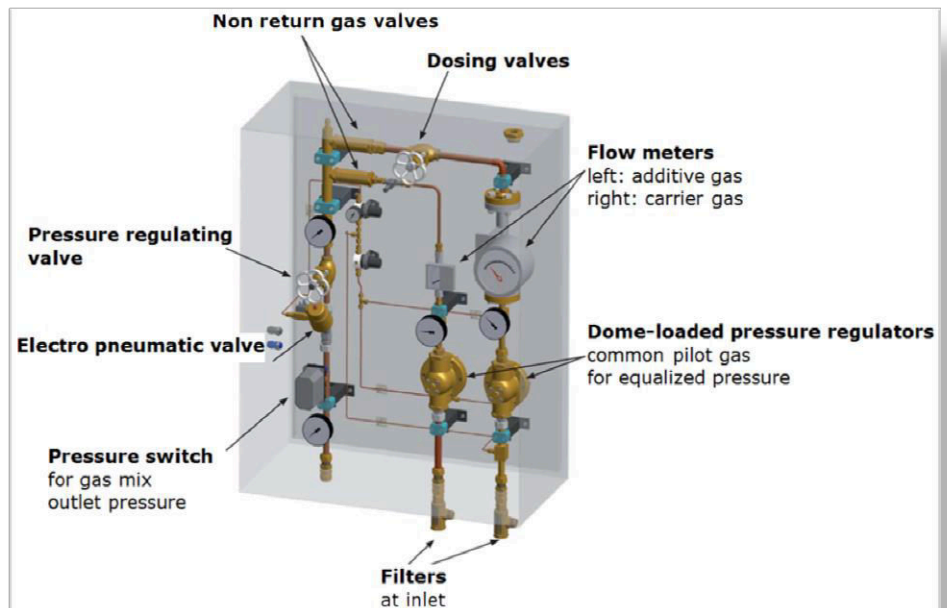
Safe provision and full documentation of defined gas mixtures for your production with Industrial IoT suitable high-tech gas mixers:

- **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

Data Sheet LT Gas Mixer type comfort

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
- $p_1 = 12\text{--}25 \text{ barg}$
- $p_2 = 2\text{--}8 \text{ barg}$
- Maximal performance: 15, 25, 50, 100, 200 or 300 Nm^3/h , indicated as maximum continuous gas mix production quantity
- Gas mix reproducibility $\pm 0,5 \text{ Vol}\%$
- 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 ($\geq 3 \text{ bar}$), 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 Nm ³ /h	GM-15-2-comfort	2-0015
	25 Nm ³ /h	GM-25-2-comfort	2-0025
	50 Nm ³ /h	GM-50-2-comfort	2-0050
	100 Nm ³ /h	GM-100-2-comfort	2-0100
	200 Nm ³ /h	GM-200-2-comfort	2-0150
	300 Nm ³ /h	GM-300-2-comfort	2-0250
Gas Mixer for 3 non-flammable gases - without buffer vessel			
	15 Nm ³ /h	GM-15-3 comfort	2-0150
	25 Nm ³ /h	GM-25-3 comfort	2-2250
	50 Nm ³ /h	GM-50-3 comfort	2-0500
	100 Nm ³ /h	GM-100-3 comfort	2-0300
	200 Nm ³ /h	GM-200-3 comfort	2-0410
	300 Nm ³ /h	GM-300-3 comfort	2-0710
Gas Mixer for 2 flammable gases - ohne Pufferbehälter			
	15 Nm ³ /h	GMB-15-2-comfort	2-0017
	25 Nm ³ /h	GMB-25-2-comfort	2-0027
	50 Nm ³ /h	GMB-50-2-comfort	2-0052
	100 Nm ³ /h	GMB-100-2-comfort	2-0120
	200 Nm ³ /h	GMB-200-2-comfort	2-0420
	300 Nm ³ /h	GMB-300-2-comfort	2-0720
Gas Mixer for 3 flammable gases - ohne Pufferbehälter			
	15 Nm ³ /h	GMB-15-3 comfort	2-0023
	25 Nm ³ /h	GMB-25-3 comfort	2-0028
	50 Nm ³ /h	GMB-50-3 comfort	2-0053
	100 Nm ³ /h	GMB-100-3 comfort	2-0130
	200 Nm ³ /h	GMB-200-3 comfort	2-0430
	300 Nm ³ /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 up-on 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 (≥ 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 (≥ 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			
	15 Nm ³ /h	GM-15-2-smart	2-5110
	50 Nm ³ /h	GM-50-2-smart	2-5310
	100 Nm ³ /h	GM-100-2-smart	2-5410
Gas Mixer for 2 flammable gases - with 90 Liter buffer vessel in stainless steel, 10 bar			
	15 Nm ³ /h	GMB-15-2-E-smart	2-5170
	50 Nm ³ /h	GMB-50-2-E-smart	2-5370
	100 Nm ³ /h	GMB-100-2-E-smart	2-5470

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
- $p_1 = 12\text{--}25$ 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, 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.

Gas Mixer for 2 non-flammable gases - with 90 Liter buffer vessel in stainless steel, 10 bar			
	15 Nm ³ /h	GM-15-2-E-smart	2-5130
	50 Nm ³ /h	GM-50-2-E-smart	2-5330
	100 Nm ³ /h	GM-100-2-E-smart	2-5430
Gas Mixer for 2 flammable gases - without buffer vessel			
	15 Nm ³ /h	GMB-15-2-smart	2-5150
	50 Nm ³ /h	GMB-50-2-smart	2-5350
	100 Nm ³ /h	GMB-100-2-smart	2-5450



LT Gas Mixer – type advanced:

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 Nm ³ /h
GM	125-2-A advanced	25 ... 125 Nm ³ /h

Flammable Gases

GMB	25-2-A advanced	1 ... 25 Nm ³ /h
GMB	125-2-A advanced	25 ... 125 Nm ³ /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** + intuitive operation by touch screen, fully automatic control
- Bidirectional **data exchange** with higher-level systems (eg 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

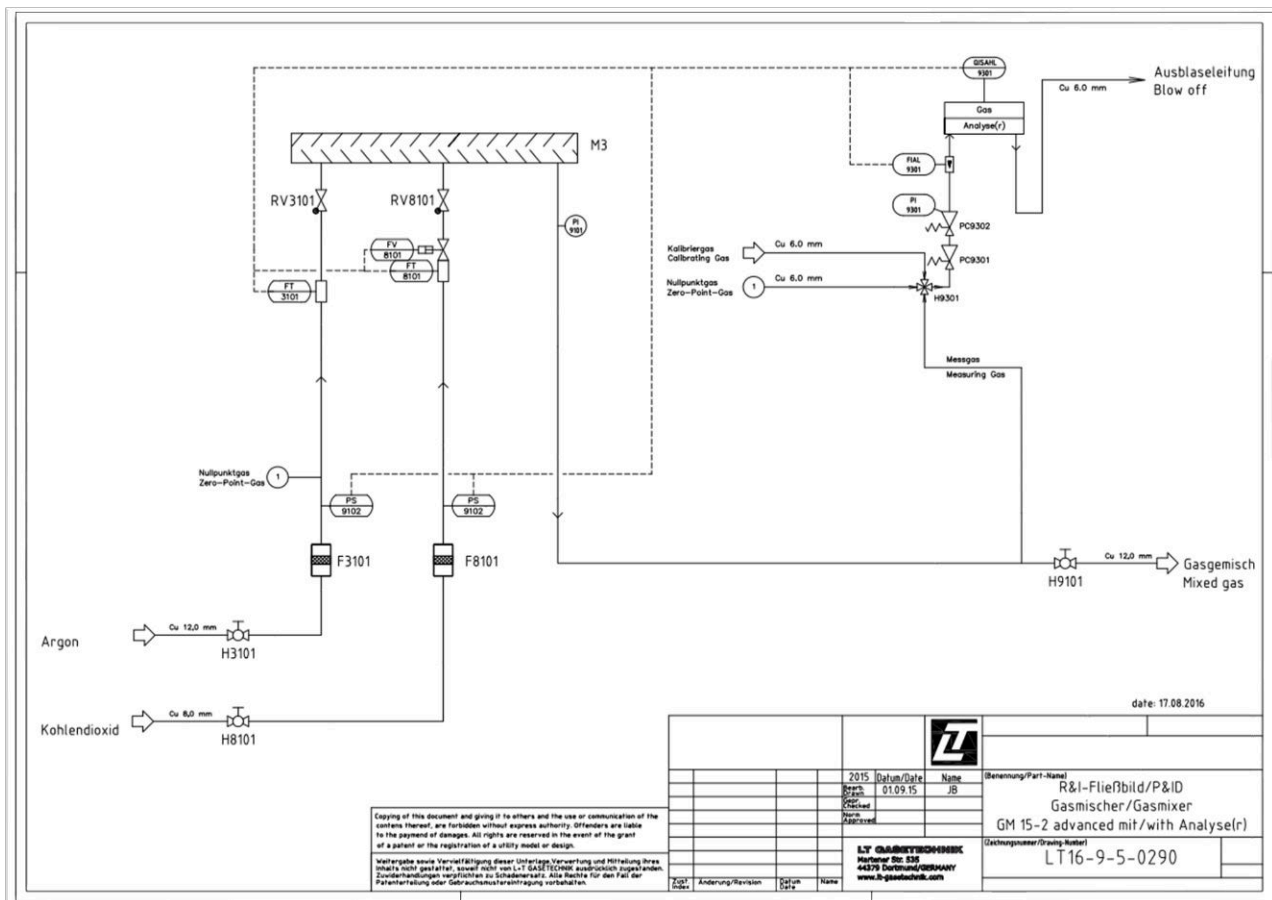
Static (mechanical gas mixer) – LT Gas Mixer type smart or comfort

Dynamic (MFC-based gas mixer) – LT Gas Mixer type advanced

	Gas Mixer static (smart or comfort)	Gas Mixer dynamic (advanced)
Gas mixture adjustment	Static gas mixer: Manual adjustment via metering valves, with manual data reading via manometer and flow meter	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
Reproducibility *	+/- 0.5%	+/- 0.2%
Achievement of exactly the same gas mixture after changing the gas mixture setting	Accurate reproduction is not possible without downstream gas analyzer due to parallax errors and different metering valve settings by different thread flanks settings	Accurate reproduction is easily possible using electronic values
Documentation of gas mixture	Possible with manual writing, which is subject to parallax errors	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.
Gas mixture adjustment	Static gas mixer: Manual adjustment via metering valves, with manual data reading via manometer and flow meter	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
Special features	<ul style="list-style-type: none"> - Long lasting - Safe - Easy to maintain 	<ul style="list-style-type: none"> - 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.



Configuration to your needs

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
 - o toxic and poisonous gases
 - o fuel gases and non-flammable gases
 - o corrosive gases

And of course we as well provide commissioning, training, service and maintenance!

Advantages of LT Gas Mixer type advanced

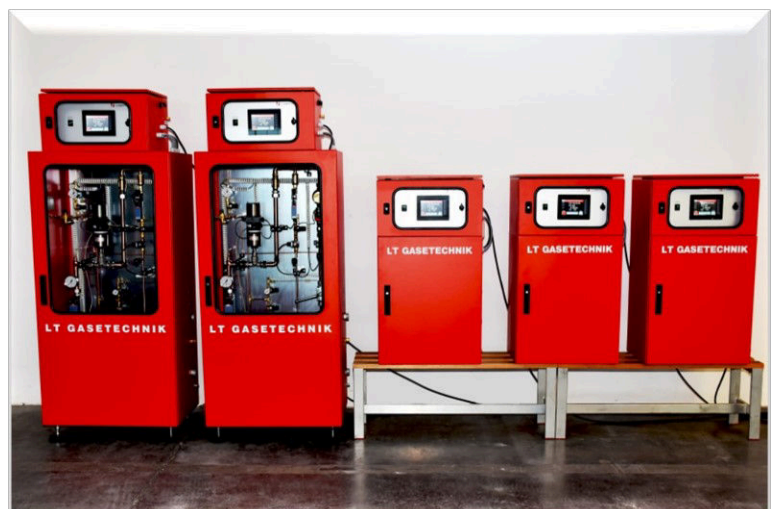
Convenient digital and precise gas mixers:

- 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



LT GASETECHNIK
beyond standards



Options for LT Gas Mixer

Options
beyond standards



LT GasAnalyser

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_{90} time < 2 seconds
 - Near infrared T_{90} 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

Measured gas	Carrier gas	Smallest range	Largest range
H ₂	N ₂ or air	0 - 0,5 Vol.%	0 - 100 Vol.%
H ₂	Ar	0 - 0,4 Vol.%	0 - 100 Vol.%
H ₂	He	20 - 40 Vol.%	20 - 100 Vol.%
H ₂	CH ₄	0 - 0,5 Vol.%	0 - 100 Vol.%
H ₂	CO ₂	0 - 0,5 Vol.%	0 - 100 Vol.%
He	N ₂ or air	0 - 0,8 Vol.%	0 - 100 Vol.%
CO ₂	N ₂ or air	0 - 3 Vol.%	0 - 100 Vol.%
CO ₂	Ar	0 - 10 Vol.%	40 - 100 Vol.%
Ar	N ₂ or air	0 - 3 Vol.%	0 - 100 Vol.%
Ar	CO ₂	-	0 - 100 Vol.%
CH ₄	N ₂ or air	0 - 2 Vol.%	0 - 100 Vol.%
CH ₄	Ar	0 - 1,5 Vol.%	0 - 100 Vol.%
O ₂	N ₂	0 - 15 Vol.%	0 - 100 Vol.%
O ₂	Ar	0 - 2 Vol.%	0 - 100 Vol.%
N ₂	Ar	0 - 3 Vol.%	0 - 100 Vol.%
N ₂	CO ₂	0 - 4 Vol.%	0 - 100 Vol.%
NH ₃	H ₂	0 - 5 Vol.%	0 - 100 Vol.%
NH ₃	N ₂	0 - 10 Vol.%	0 - 100 Vol.%
CO	H ₂	0 - 2 Vol.%	0 - 100 Vol.%
SF ₆	N ₂ or air	0 - 2 Vol.%	0 - 100 Vol.%

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. Infraredsensor, standard gases and ranges

	Smallest range	Largest range
CO	0 to 1000 Vol.ppm	0 to 100 Vol.%
CO ₂	0 to 30 Vol.ppm	0 to 100 Vol.%
CH ₄	0 to 5 Vol.%	0 to 100 Vol.%
NO	0 to 3000 Vol.ppm	0 to 4 Vol.%
SO ₂	0 to 1000 Vol.ppm	0 to 1 Vol.%
NH ₃	0 to 20 Vol.ppm	
CF ₄	0 to 2000 Vol.ppm	

3. Paramagnetic Sensor, ranges

	Smallest range	Largest range
O ₂	0 to 10 Vol.%	0 to 100 Vol.%

Design

Versatile analysis system with convenient features:



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



LT GasAnalysator
in separate housing incl. isolated barriers to the ex zone 1

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



Redundant LT GasAnalyzer in wall housing with automatic gas mixer switch over

Buffer vessels

Buffer vessel designs

LT GASETECHNIK offers buffer vessels in the following standard versions:

Volume [Liter]	Pressure [bar]	Material	Position
90	10 or 25	Stainless steel	Horizontal
250	16	Steel or stainless steel	Standing or horizontal
500	16	Steel or stainless steel	Standing or horizontal
1.000	10 or 16	Steel or stainless steel	Standing or horizontal

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-litre 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.

Complete, ready to operate, audited quality

Material

The buffer vessel for the LT GAS MIXER 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.

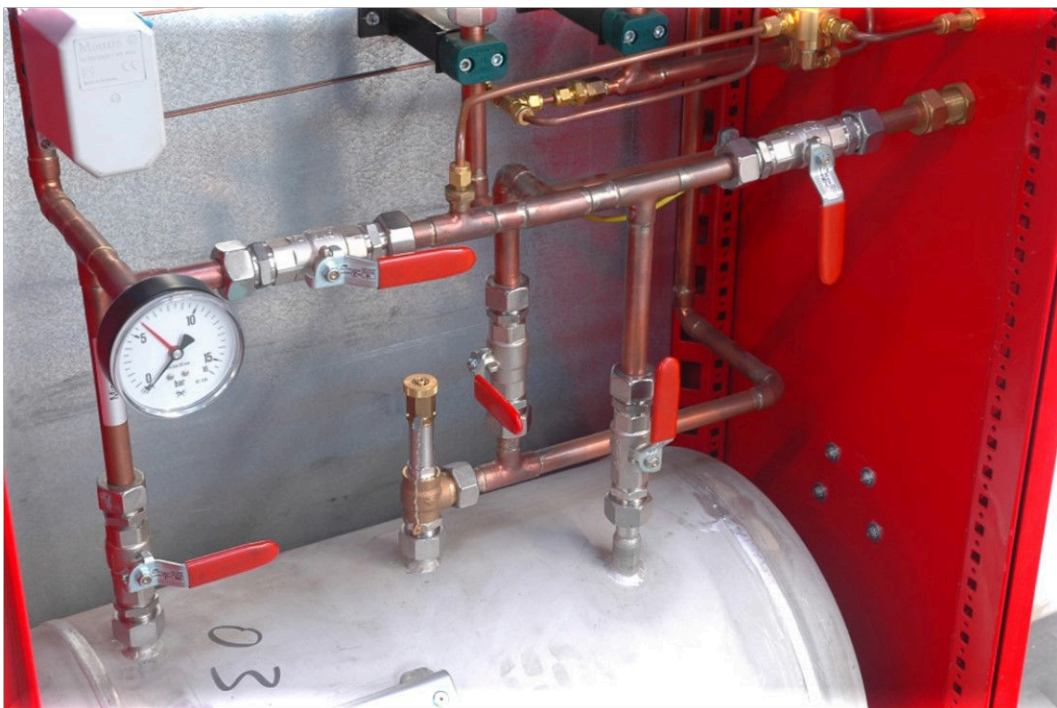
Bypass

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**.

Gas pipes, connections



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 simplifying and as a rough rule of thumb for a "correct buffer volume", 10% more buffer volume in litres than gas mixer capacity in Nm³/h. this under the boundary conditions $dp=0.5$ (difference pressure between on and off) and mixing time ≥ 2 sec. In addition, certain standard sizes have been established, which also depend on the size of the tori-spherical heads.

Our process engineers will gladly assist you with the definition.

Sizes are 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



LT Remote Support

Optimization or service tasks can be fulfilled by remote maintenance or remote data access via VPN module: Temporary online customer support via remote support also behind firewalls, eg. to aid in troubleshooting. With this secure access, LT can work on the customer premises as if the LT technicians were on site.

Our Solution

The remote support can be carried out (according to the current status of LT technology) by the following alternatives:

For plant control systems (of the brands Siemens, ABB):

- Choice of option remote maintenance module
Integration of the controller with the Internet, connection via VPN and a remote service portal. For remote maintenance: Connection release by the system operator.

For Operator-Control-Systems:

- Choice of the option Ethernet-interface:
For remote maintenance: Connection of a mobile customer computer with Internet access via Ethernet interface with the LT-OCS controller. Communication via VPN and team viewer. Access via ID and one-time password.
- Choice of option Installation of a GSM module.
Establish internet connection with sim card by customer. For remote maintenance: Connection release by the system operator, communication via VPN.

The security is ensured in particular by the following points:

- Connection only after approval by the system operator. No active connection can be established.
- Access only via VPN (Virtual Private Network). This uses an encrypted layered tunneling protocol and is thus an enclosed communication network that uses the existing communication network as a transport medium. The VPN connection is made exclusively with the assigned partner and thus reduces the networks between the VPN partners to the function of an extension cable. Depending on the VPN protocol used, this is supplemented by encryption, which enables tap-proof and tamper-proof communication between the VPN partners.
- Even if the connection is made over the corporate network, LT can access customer control over a secure connection without direct access to the corporate customer network.



Advantages

- Shorter response times for service: LT is able to help quickly and easily: While the customer is phoning with the LT specialist, LT can use the remote maintenance software to look at the system
- Full integration: LT sees the plant screens and can operate them. At the same time, the customer can follow exactly what LT is doing on the screen. For control questions this increases the learning effect as the customer sees directly how it works.
- On-site service calls can often be completely avoided: Remote maintenance costs are lower than when an LT specialist has to travel to the facility.
- Easy-to-use solution, tailored to industrial automation: The use of the remote maintenance program is intuitive and is usually possible without instructions
- Plant optimization without separate trip: Most after a few weeks of operation of a plant, an optimization of the following points should take place:
 - Checking the control strategies, and optimizing the stability and speed of the control loops on the basis of operating experience: disturbance size changes, ramps, hysteresis, limit values.
 - Optimization transients, overshoots
 - Influence of parameter changesAll this can be executed remotely.

Costs

For remote support costs occur from

- The provision of the infrastructure (hardware, remote maintenance software, software version of the individual system, employee time)
- For commercial billing
- For the actual time required for remote maintenance.

Without a maintenance contract, we charge 12 € per work unit for 5 minutes for the remote maintenance. The minimum charge is 5 work units. For the provision of the infrastructure and commercial billing, we charge a flat rate of € 950 per year.

With a valid maintenance contract, we charge 10 € for the remote maintenance per work unit of 5 minutes. The minimum charge and provisioning of infrastructure is included.

The calculation takes place at the end of the month as a collective invoice.

Of course, the cost will only be invoiced if the support is executed outside the warranty period due to an error, not attributable to LT, or if you ask for assistance.

LT Automatic Gas Mixer Switch-Over

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, Profibus, 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, eg. to help with troubleshooting
- Redundant System to increase the availability



*Automatic Gas-Mixer Switch-Over
in wall housing*



*Automatic Gas-Mixer Switch-Over
with LT GasAnalyzer with
e-mail dispatch*



LT inlet pressure monitoring

Disruptions in the protective gas supply usually cause production downtime. The LT GASETECHNIK inlet pressure monitoring system permanently checks gas pressures, e.g. at the inlet of the gas mixer. This means that an alarm is raised early in the event of disruptions in the gas supply and production downtime can be prevented.

The LT inlet pressure monitoring is a modular system with many integrated functions, expandable with individual options:



Advantages

- Monitoring and pressure display of up to 4 gas inlets simultaneously
- Continuous monitoring of the freely adjustable limit values with alarm triggering and switching of a potential-free contact
- Increased process reliability through automatic process stop or automatic switchover to backup supply
- Convenient and intuitive to operate via color touch screen, connection to higher-level systems possible
- Password-protected user levels
- Ethernet port for data transfer

Frühzeitige Information über Störungen in der Gasversorgung

LT inlet pressure monitoring data

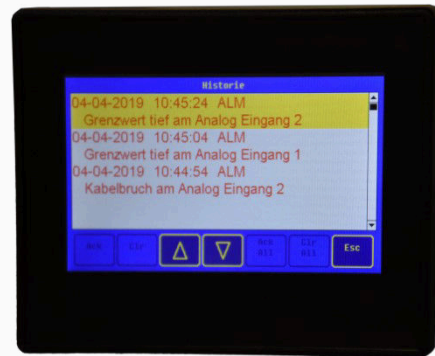
- Fully automatic operation, with integrated LT ControlUnit smart
- Monitoring of up to 4 pressure transmitters e.g.
 - o Input gases 1 and 2
 - o Gas mixture output gas mixer
 - o Pressure of emergency supplies
- Analog inputs: 4 x 4-20 mA
- Load capacity of the potential-free contacts: 60V 3A / 24V DC 3A
- Weight approx. 3.7 kg, dimensions 296 x 281 x 158 mm
- Power supply 230 V AC
- For verification with integrated data logger



*LT inlet pressure monitoring with open door
Screen = trend display
LT article no.: 2-4052*



User interface: Settings input, output, language



User interface: History with sample alarm messages

Options

Modular system, configurable according to your specifications:

- For flammable gases for operation outside Ex areas including integrated isolating amplifiers
- FTP server for data transfer
- Interfaces: Modbus RTU, TCP/IP, Ethernet, 4-20 mA
- Relay output with load capacity of the potential-free contacts: 230V AC 8A
- Upgrade for outdoor installation (with rack on request)
- Light with horn for status signaling
- Other user interface languages
- Expansion of the control to LT ControlUnit comfort:
 - USB port for data transfer
 - GSM module for sending **email or SMS**
 - Interfaces: Profibus, CANopen



LT input pressure monitoring based on the LT ControlUnit comfort with GSM module for sending SMS



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.

Tailorized equipped



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)

Emergency supply increases production reliability

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 mix 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, ie. 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 touch-screen) 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.

Typical work scope:

- 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.

Optionally during this phase the scope as listed in "Phase 3 Optimization" can be repeated.

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 GASETECHNIK 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 GASETECHNIK. Upon return, the devices are dismantled. The housing, electronic components and steel, copper or brass components are fed into the recycling cycle.



LT GASETECHNIK
beyond standards



Several Information about LT GASETECHNIK

Informations

beyond standards

Manufacturing standards and QM

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
 - DIN EN ISO 12100 :2011-03
 - DIN ISO/TR 14121-2:2013-02
 -

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 2
 - DGUV 3 Electrical equipment and production facilities
 - DGUV R 500 part 2.26 Welding, soldering, cutting and related
 - DGUV 4, 79 and 80
- BG-Directives . especially
 - DGUV R 113-001 Rules for explosion prevention
 - DGUV Information Use of static gas alert equipment
 - 213-57 to prevent explosions
 - DGUV Information 201-052
 - DGUV Information 209-072
 - BGI 612 Hydrogen



LT GASETECHNIK
beyond standards



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
Directive
production
acceptance

authorized according to
97/23/EC for internal
control with monitoring of
(**module A2**).

Compliant design and manufacturing



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:

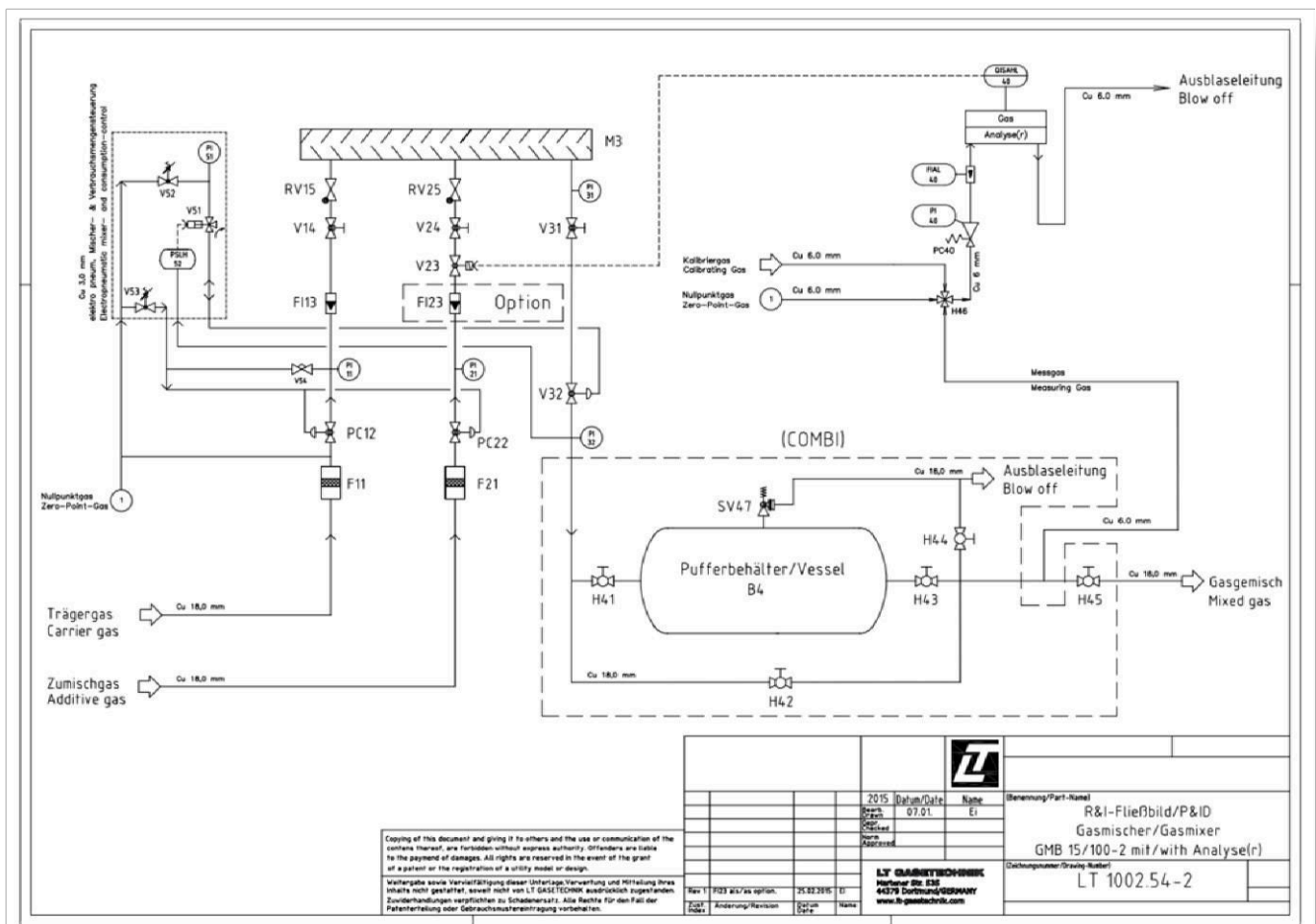
- Preparation of the HAZOP study based on your planning documents
- Chair the HAZOP meetings with your team members
- Summary of the results of the meetings in an elaborated study
- Assistance of your employees with the implementation of the specified measures

ID	Parameter	Characteristic	Cause	Impact	Hazard evaluation with not-validated rated risk			Action, question, recommendation	Hazard evaluation	
					S	W	R		C	F
1	Flow	no	inlet or outlet closed	compressor gets damaged				automatic compressor shut off is implemented		
1.1	Flow	low	inlet or outlet profile reduced, flow fouling	compressor gets damaged				automatic compressor shut off is implemented		
2	Pressure									
2.1	Pressure	high (pico bags)	outlet reduced or compressor failure	damages on piping and vessels, risk for people staying next to the plant	1	2	1	caution	Safety valve (pico bags) installed	
2.2	Pressure	loadage on pressurized equipment	vibration	leakage of flammable gas, loss of oxygen	0	1	0		Plant is (technical) safe on permanent compressor equipment, notification (to compressor inlet, pressure below atmospheric)	
2.3	Pressure	loadage on compressor (shaft power)	technical possible	leakage of flammable gas	0	2	0			
3	Temperature									
3.1	Temperature	high (inlet to the plant)	heat exchanger in operation	danger for people next to the heat exchanger outlet	1	2	1	caution	installing barriers to prevent stay within the persons space and/or training of personnel	
3.2	Temperature	high (within piping)	heat exchanger malfunction	damages on piping or vessels						
4	External impacts									
4.1	external impact	collision	maloperation	maloperation					training personnel, avoiding unauthorized access	
4.2	external impact	collision	maloperation	maloperation					avoiding unauthorized access	
4.3	external impact	collision	maloperation	maloperation					installing collision protection	
4.4	external impact	collision	maloperation	maloperation						
4.5	external impact	collision	maloperation	maloperation						
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4.100	external impact	collision	maloperation	maloperation						



P&I Diagram and Documentation

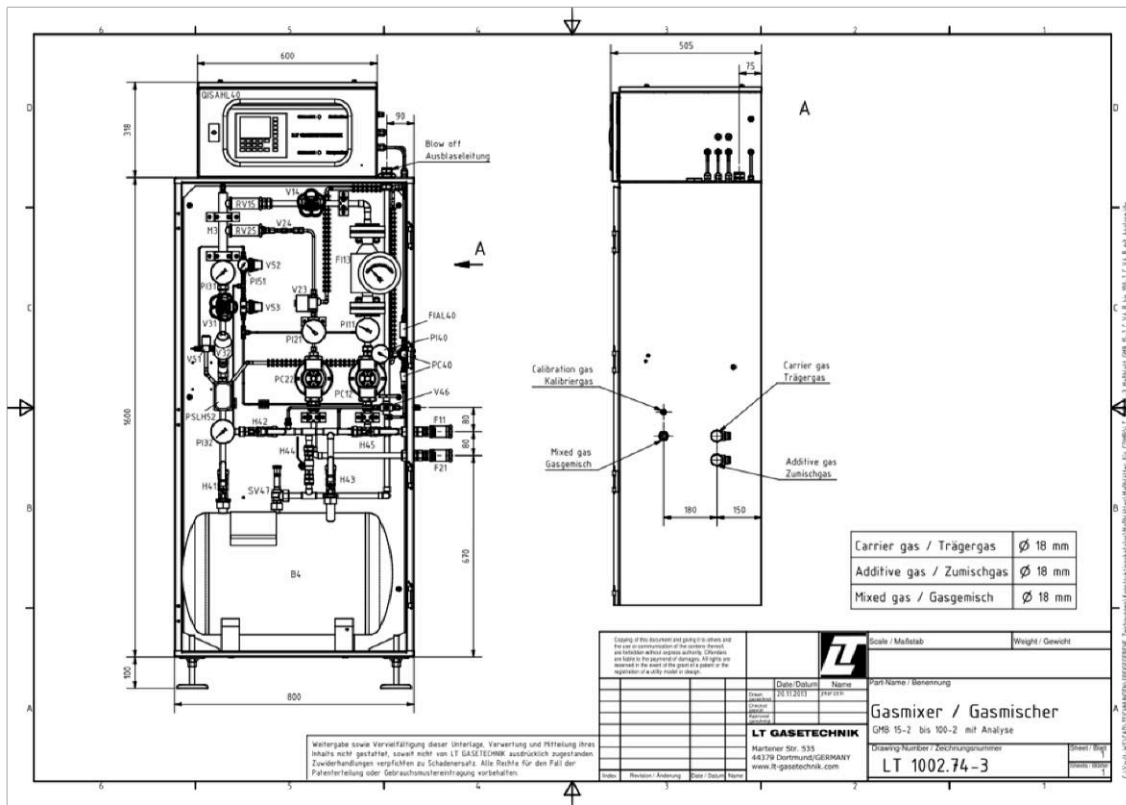
In this brochure, we cannot show all of our piping and instrumentation diagrams, as you can select from 72 gas mixers models. In addition to these serial gas mixers, customer-specific solutions are our specialty. With every gas mixer you will of course receive a comprehensive documentation and an individual P&I diagram. For example, this can look like this:



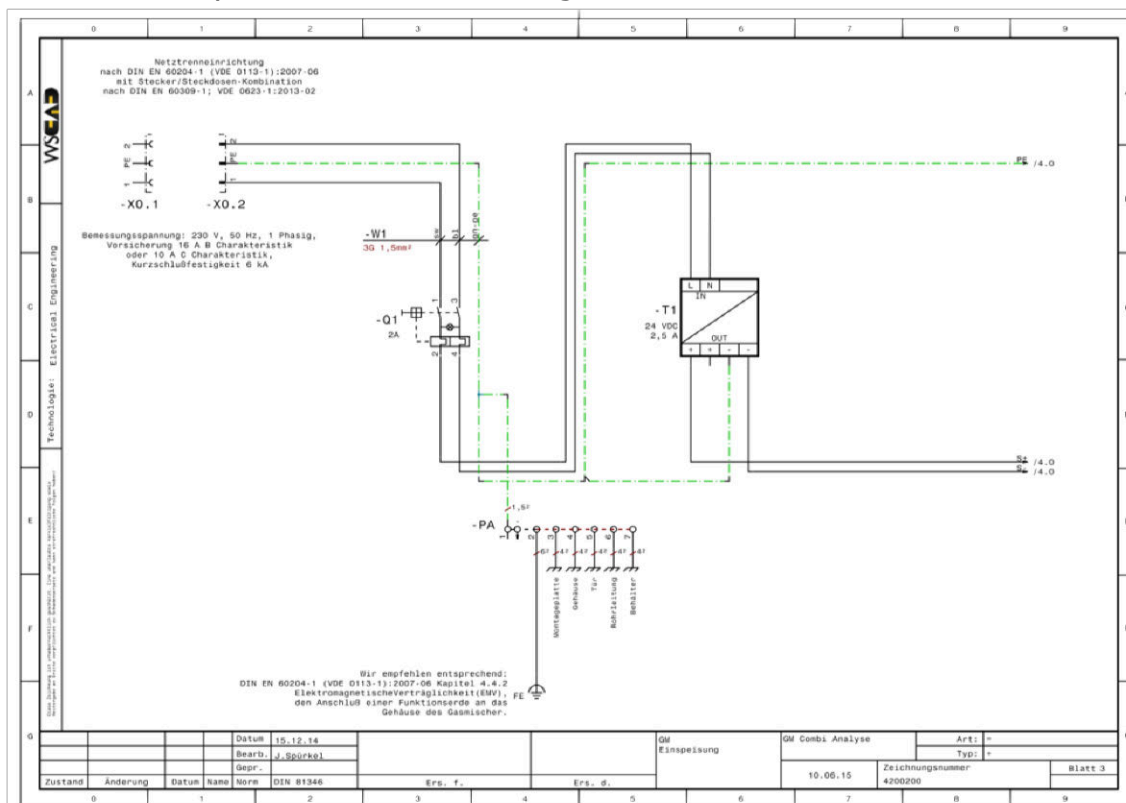
Comprehensive documentation for safe operation



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.

 LT GASETECHNIK beyond standards								
Armaturenliste GM 50-2 C VA B								
Armaturen Nummer	Bezeichnung	Hersteller	Typ	CE Kategorie	Serien Nummer	LT Nummer	Armaturenanschluss	
							Ein- gang	Aus- gang
B4	90 l Pufferbehälter	LT GASETECHNIK	28L, PN 25, Edelstahl 1.4571	IV	123	2300011	28L	28L
F11	Gasfilter	LT GASETECHNIK	GR 8500, Filtereinsatz CrNi-Sintermetall	Art. 3 Abs. 3		3065200	RS18DK	G1/2"
F21	Gasfilter	LT GASETECHNIK	GR 8500, Filtereinsatz CrNi-Sintermetall	Art. 3 Abs. 3		3065200	RS18DK	G1/2"
F13	Ganzmetall-Durchflußmesser	Hersteller 1	XYZ01235Beispiel	Art. 3 Abs. 3	12345678890	2005004	Flan. DN15	Flan. DN15
F23	Ganzmetall-Durchflußmesser	Hersteller 1	XYZ01235Beispiel	Art. 3 Abs. 3	12345678890	2005009	3/8" npt	3/8" npt
H41	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3287003	G1/2"	G1/2"
H42	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3287003	G1/2"	G1/2"
H43	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3287003	G1/2"	G1/2"
H44	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3287003	G1/2"	G1/2"
H45	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3287003	G1/2"	G1/2"
H46	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3287003	G1/2"	G1/2"
H46	Handkugelhahn DN15/PN40	Hersteller 2	D325090-15-G1/2	Art. 3 Abs. 3		3279002	G1/4"	G1/4"
PC12	Druckminderer	LT GASETECHNIK	LTD1, Messing, Viton, Mitteldruck	Art. 3 Abs. 3	12345678890	3711000	G1"	G1"
PC22	Druckminderer	LT GASETECHNIK	LTD1, Messing, EPDM, Mitteldruck	Art. 3 Abs. 3	12345678890	3715000	G1"	G1"
R11	Manometer NG80	LT GASETECHNIK	0-16 barg, rückseitig mittig, K1.1.6, Überdrucksicher 25 barg	Art. 3 Abs. 3		2001415	G1/4"	-
R21	Manometer NG80	LT GASETECHNIK	0-16 barg, rückseitig mittig, K1.1.6, Überdrucksicher 25 barg	Art. 3 Abs. 3		2001415	G1/4"	-
R31	Manometer NG80	LT GASETECHNIK	0-16 barg, rückseitig mittig, K1.1.6, Überdrucksicher 25 barg	Art. 3 Abs. 3		2001415	G1/4"	-
R32	Manometer NG80	LT GASETECHNIK	0-16 barg, rückseitig mittig, K1.1.6, Überdrucksicher 25 barg	Art. 3 Abs. 3		2001415	G1/4"	-
R51	Manometer NG40	LT GASETECHNIK	0-16 barg, rückseitig mittig, K1.1.6	Art. 3 Abs. 3		2001002	G1/8"	-
RSLS2	Druckschalter, elektrisch	LT GASETECHNIK	MCS11	Art. 3 Abs. 3		2001022	G1/4"	-
RV15	Gasrückflüßsicherung	LT GASETECHNIK	RK 8000	Art. 3 Abs. 3		1831000	G3/8"	G3/8"
RV25	Gasrückflüßsicherung	LT GASETECHNIK	RK 8000	Art. 3 Abs. 3		1831000	G3/8"	G3/8"
S47	Sicherheitsventil	Herose	25 barg, 06478.1518.9151	IV	12345678890	4040118	18L	18L
V14	Dosierventil	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2010028	Muffe 12 mm	Muffe 12 mm
V24	Dosierventil	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2002205	G1/8"	G1/8"
VC1	Staudruckventil	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2010027	Nippel 18 mm	Nippel 18 mm
V32	PN-Ventil DN15/PN40	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2010002	G1/2"	G1/2"
V51	3/2-Wege-Vorstauermagnetventil, 230 VAC	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2044009	G1/8"	G1/8"
V52	Druckregler Steuergas	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2400120	G1/8"	G1/8"
V53	Druckregler Gleichdruck	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2400120	G1/8"	G1/8"
V54	Drossel	LT GASETECHNIK	XYZ01235Beispiel	Art. 3 Abs. 3		2001036	-	-

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



Gas Mixer – yesterday and today

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



LT GASETECHNIK
beyond standards



1994 the first
LT GasAnalyzer



2009
2- and 3-gases mixer
with and without buffer vessel



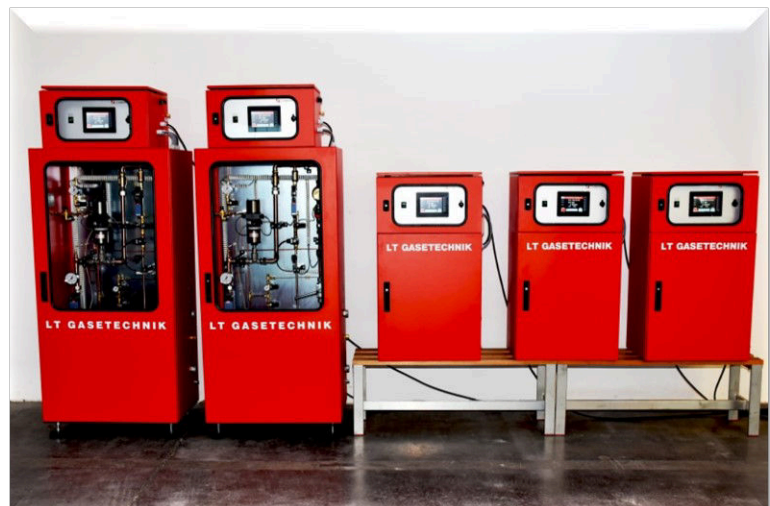
2016
Gas mixer types smart, comfort and advanced

Competent in gas mixing technology since 1971



2017
gas mixer type advanced
for Ar/CO₂

Progress from tradition



2018
gas mixer type advanced
for combustible gases

Unique selling propositions

Gas process plants

- Engineering, production and commissioning of gas mix and gas supply systems according to customer specifications
- High-performance systems with measurement+control equipment and gas analysis
- 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 + analysis tech

- Individual solutions for control and regulation tasks
- Engineering, design, PLC-software design
- Technical process engineering C&I
- Gas analyzers
- Standard equipment for gas applications

From one **SINGLE** source:

1. Consulting (URS/FRS)
2. Concept and detail engineering for the **mechanical part** (DQ/FDS)
3. Engineering, design and programming for the **electrical part**: Measuring, control and automation system, including gas analyzing technology
4. Manufacturing, testing (FAT) and **commissioning** (SAT) of the systems
5. Documentation including **CE**-Marking, **Risk-Analysis**, **HAZOP**-Study, **SIL**-Classification if so desired



About LT GASETECHNIK

Integrated in the weyer group and based in Dortmund, Germany, since 1971, approximately 25 specialists develop and supply high-performance gas mixing equipment, serial gas mixers, serial valves and tailor-made control solutions in a yearly volume of 2...2.5 Mio. €. 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. We deliver and service worldwide. 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 and Pharmaceutical 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

Competency from LT GASETECHNIK – worldwide since 1971

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.

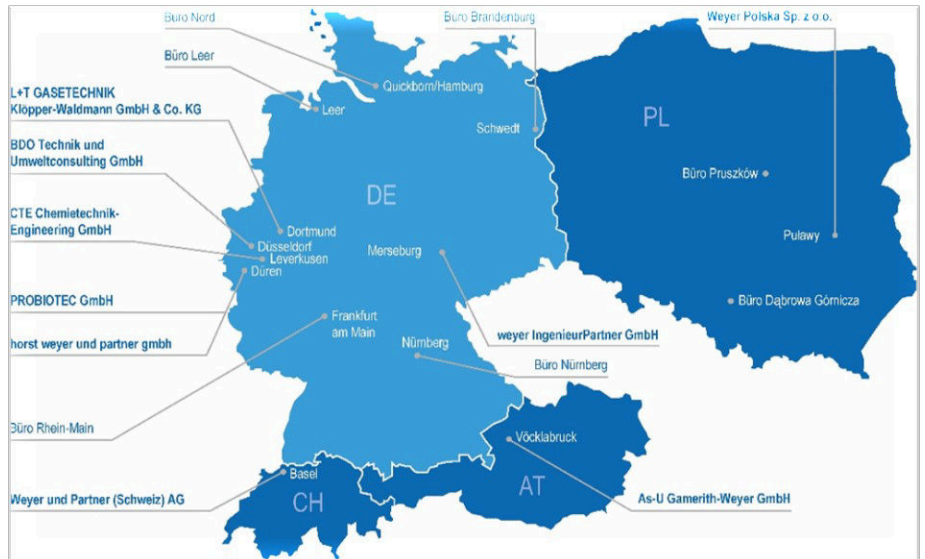


Member of the weyer group

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 Klöpfer-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, imission 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

This supply range only gives 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



LT GASETECHNIK
beyond standards



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