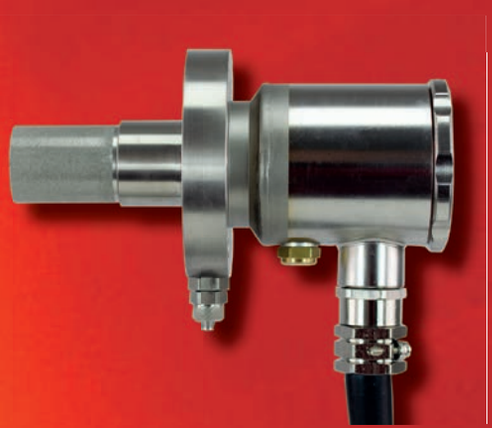


System overview

Lambda Transmitter LT4
KS1D Combination Probe
FTU Function Test Unit

LAMTEC

Sensoren und Systeme für die Feuerungstechnik

www.lamtec.de

LAMTEC measuring system LT4 with KS1D and optional FTU.

The only solution of its kind worldwide for SIL3 monitoring and measurement.

With the Lambda Transmitter LT4, LAMTEC offers an exclusive device for the simultaneous measurement and monitoring of oxygen (O_2) and oxidising gas components (CO_2) in accordance with SIL3 and DIN EN 12067-2.

The LAMTEC Lambda Transmitter LT4, in conjunction with the LAMTEC KS1D combination probes, is a microprocessor-based measuring device for universal use. This transmitter was developed specifically for the simultaneous measurement and detection of O_2 concentration and oxidising gas components CO_e (CO/H_2) in flue gases from combustion plants in the over-stoichiometric range ($\lambda > 1$). The measured value CO_e (e = equivalent) represents a sum signal of all oxidising flue gas components such as CO and H_2.

The LT4 evaluates the voltage values of two measuring electrodes U_{O2} (oxygen line) and mixed potential ($U_{O2 + UCO/H2}$). The mixed potential is formed very quickly; as the unburned content increases, this behaviour leads to a rapidly growing dynamic of the sensor signal.

Lambda Transmitter LT4

Advantages:

- Direct (in situ) measurement of oxygen (O_2) and detection of oxidising exhaust gas components COe (CO/H2) in flue gas up to 1,400 °C
- O_2 measuring range: 0 to 21 vol. %
- CO_e-measuring range: 0 to 10.000 ppm
- False air independent (CO_e)
- No gas conditioning required,
- measurement directly in moist flue gas
- Settling time to 60% value (T_{60})
  O_2 < 3 seconds (unfiltered)
  CO_e < 3 seconds (unfiltered)
- Low heating consumption
- Certified flame arrestor
- Easy handling – probe connection via plug connection
- Low maintenance
- Approved according to DIN EN 16340 and 12067
- World's first SIL3 measuring system

The measuring principle

The KS1D combination probe is based on a heated electrochemical measuring cell made of zirconium dioxide ceramic (ZrO_2).
It has 3 electrodes:

- O_2electrode (platinum)
- CO_e electrode (platinum/precious metal)
- Reference electrode (platinum)

The zirconium dioxide ceramic, which is closed on one side, protrudes into the exhaust gas duct of the combustion plant and separates the reference gas space (environment) from the measuring gas space (exhaust gas duct) in a gas-tight manner.

The LT4 was developed specifically for the safe output of COeand O_2 measurement and limit values. This makes it ideal for monitoring and control with and without LAMTEC burner management. The operating mode is designed as High Demand or Continuous Mode, which is also a unique selling point on the market. The various SIL and standard classifications are fuel-dependent and can be found in the following table.

LT4 exclusive SIL certification:

Digital outputs based on mV signal**:**

- SIL3 Oil/gas – without FTU
- SIL2 All fuels – without FTU
- SIL3 All fuels – with FTU

AAnalogue outputs based on measured values:

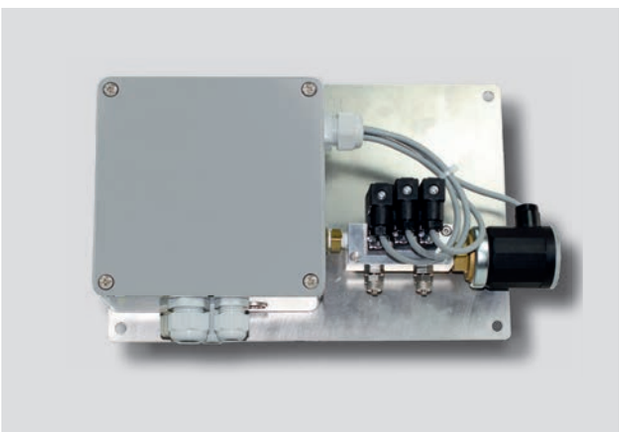
- SIL2 Oil/gas – without FTU
- SIL1 All fuels – without FTU
- SIL2 All fuels – with FTU

Product standard DIN EN 16340/12067-2 with FTU

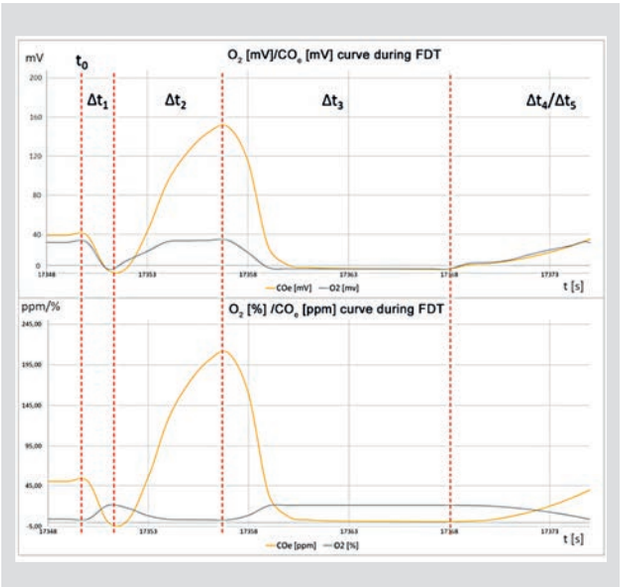
The digital outputs are always available on board, while the analogue outputs are available as an LSB module.

Function test unit FTU

As an extension of the LT4, the FTU is available to improve the SIL classification and to achieve compliance with the DIN EN 12067-2 standard through optimised fault detection. This allows faults or drift phenomena at the sensor to be reliably detected within a maximum of 24 hours by means of a probe test. The LT4 controls the valves and pump of the FTU in order to feed test gases to the sensor and ensure repeatable signals. The FTU can also serve as a probe connection box.



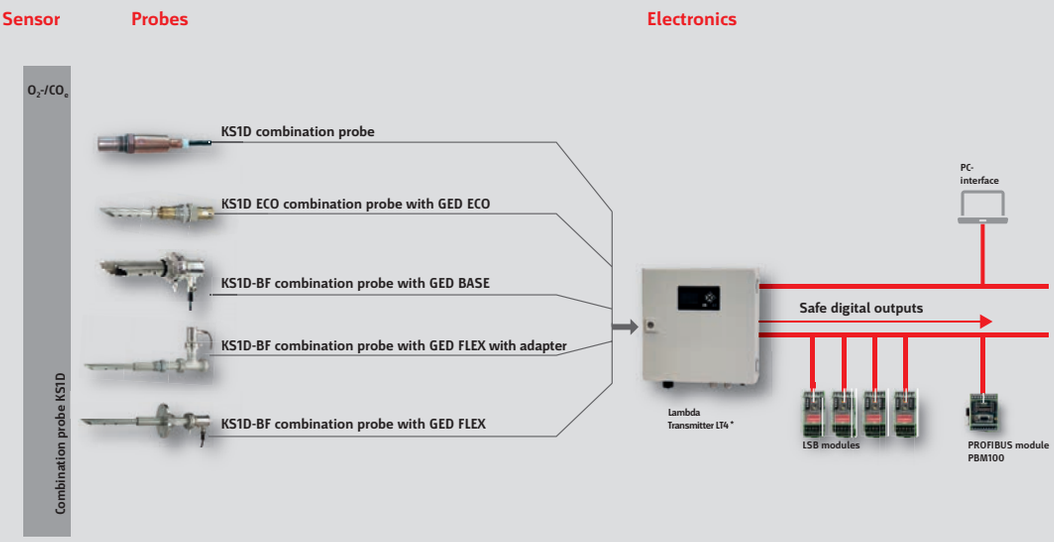
FTU function test unit



Probe signal during FTU function and drift test

System overview.

Possible probe types.

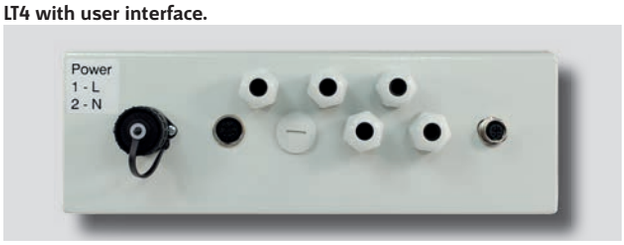


*Only one probe is possible per LT4.

Function overview LT4 with KS1D.

Basic system.

LT4 with user interface.



Connections LT4 on underside.

Lambda Transmitter LT4

The LAMTEC Lambda Transmitter LT4 is supplied with a user interface (UI). This is located on the front door and has the following functions:

- Reading O_2 and CO_e measurement values
- Information about the probe and fuel, warnings and malfunctions, software version, CRC and serial number
- Calibration of the measurement
- Settings for maintenance, filter time, analogue and digital outputs, probe replacement, display, other function and parameter settings.
- FTU settings

The following connections are located on the underside of the device:

- Supply voltage
- Probe connection (probe signal/probe heating)
- External LSB connection for PC (use of LSB remote software)
- Cable bushing-through for LAMTEC SYSTEM BUS connection
- Cable bushing for connecting LSB modules
- Cable bushing for connecting FTU

Probes.

LAMTEC probes enable simultaneous in situ measurement and detection (KS1D combination probe) of O_2 concentration and combustible oxidising gas components (CO/H_2), displayed as CO_e..

KS1D combination probe

Combination probe KS1D

Features:

- Ideal flue gas velocity: 1-4 m/s
- Flue gas temperature: ≤ 450 °C
- Permissible exhaust gas temperature at the probe head 300 °C for device variants with SIL certificate (SIL1, SIL2, SIL3)
- Protection class is IP42; outdoors, the probe must be protected from water, snow, etc.

Areas of application:

- Natural gas, heating oil EL.

Kombi-Sonde KS1D ECO with GED ECO

KS1D combination probe with GED ECO

Features:

- Ideal flue gas velocity:
  at gas temperatures < 100 °C: 1 < x < 6 m/s
  at gas temperatures > 100 °C: 1 < x < 12 m/s
- Flue gas temperature: ≤ 300 °C
- Dust concentration: ≤ 100 mg/m^3
- Permissible exhaust gas temperature at the probe head 300 °C for device variants with SIL certificate (SIL1, SIL2, SIL3)
- Protection class is IP42; outdoors, the probe must be protected from water, snow, etc.

Areas of application:

- Natural gas, heating oil EL.

Combination probe KS1D-BF with GED BASE

KS1D-BF with GED BASE

Features:

- Tested filter concept against flashbacks in H_2-applications
- Ideal flue gas velocity:
  at gas temperatures < 100 °C: 1 < x < 10 m/s
  at gas temperatures > 100 °C: 1 < x < 20 m/s
- Flue gas temperature: ≤ 550 °C
- Dust concentration: ≤ 200 mg /m^3
- Calibration during operation using test gas is
- possible.
- Permissible exhaust gas temperature at the probe head 300 °C for device variants with SIL certificate (SIL1, SIL2, SIL3)
- Protection class is IP65.

Areas of application:

- Natural gas, EL heating oil

KS1D-BF combination probe with GED FLEX

KS1D-BF with GED FLEX

Features:

- Tested filter concept against flashbacks in H_2-applications
- Ideal flue gas velocity: 0,1-30 m/s
- Flue gas temperature depending on the material: ≤ 1400 °C
- Dust concentration: ≤ 1000 mg/ m^3
- Adjustment during operation using test gas is possible.
- The immersion depth can be adjusted variably.
- Using a suitable T-adapter, the GED FLEX can be
- blown out or fitted with an ejector.
- Permissible exhaust gas temperature at the probe head 300 °C for device variants with SIL certificate (SIL1, SIL2, SIL3)
- Protection class is IP65.

Areas of application:

- Natural gas, EL heating oil, S heating oil, coal, special fuels, hydrogen.

Optional components.

LSB modules
The LSB modules are universally applicable input and output modules that are controlled via LAMTEC SYSTEM BUS. The module is addressed via an adjustable address. The relay outputs are activated manually via switches.

Analogue outputs:
FThere are two different modules for analogue outputs:
- Current module with 4 analogue outputs 0/4 to 20 mA
- Voltage module with 4 analogue outputs 0/2 to 10 VDC

Digital inputs:
The digital LSB module has 4 inputs. A jumper plug allows two modules to be quickly wired together, increasing the number of inputs to 8.

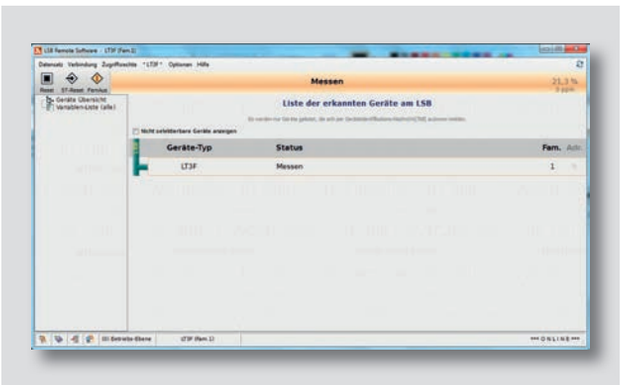
LSB module for calculating combustion efficiency:
The efficiency module has the following features:
- Two Pt100 temperature inputs for measuring the flue gas and ambient temperature
- Two analogue outputs 0/4 to 20 mA for outputting the flue gas temperature and efficiency
- Supply voltage 24 VDC / 50 mA

PROFIBUS communication:
The fieldbus modules are connected via the LSB. PROFIBUS communication offers many advantages in terms of integration into a higher-level process and building management system.

- Installation either directly in the LT4 or externally, e.g. in the control cabinet
- Fast and accurate transmission of process values
- Direct reading of inputs and outputs
- Remote diagnosis by reading the fault history

LSB-Remote-Software

The PC interface via remote software and USB module makes working with the Lambda Transmitter LT4 even more convenient: the device can be remotely controlled via a notebook, allowing the set configuration and curve data to be archived. This enables quick and easy data backup, which can be restored in an emergency, restoring operational readiness in just a few minutes. Using the LSB remote software, the LAMTEC Lambda Transmitter can also be queried and monitored from your office without having to be on site.



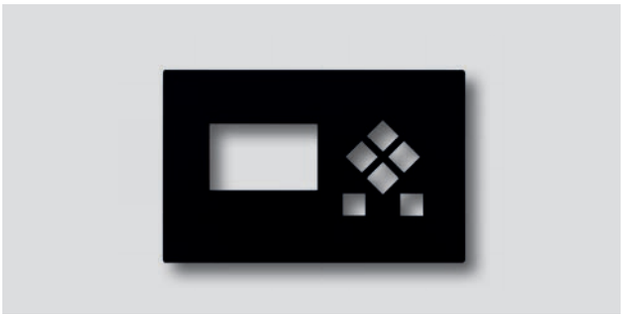
Probe connection box SAK

The LAMTEC probe connection box SAK is designed to bridge longer distances between LT4 and probe without extension cables (> 2 or 5 metres). The probe connection socket and blanking cover on the LT4 are replaced with the cable glands supplied. The SAK includes a terminal strip and conversion to probe plugs. The SAK is not required when connecting via the FTU.

Cover IP65

Cover for UI300-LT4-V2, delivery includes mounting nuts.

- Cover to achieve IP65 protection class



Additional IP65 cover for user interface

Inputs.

Outputs.

LSB module
Analogue outputs

- 1 O_2-Measured value
- 2 CO_e-Measured value
- 3 Not assigned
- 4 Not assigned

Onboard
Digital outputs

- 1 Limit value 1
- 2 Limit value 2
- 3 Limit value 3
- 4 Fault
- 5 Not measuring
- 6 Not assigned

- 1 Flue gas temperature detection
- 2 Ambient temperature detection

LSB module
for calculating combustion effi ciency

- 3 Flue gas temperature
- 4 Efficiency

- 1, 2 Fault/warning reset
- 3 ID of digital module 1 to 16
- 4 Bit coding to set digital outputs

PROFIBUS communication

- 1, 2 CO_e-Actual value
- 3, 4 CO_e-Actual value status
- 5, 6 O_2-Actual value
- 7, 8 CO sensor voltage raw
- 9, 10 O_2 sensor voltage raw
- 11, 12 Probe voltage U_{CO_e}
- 13, 14 LT4 Status
- 15, 16 Warning value 1
- 17, 18 Warning value 2
- 19, 20 Fault value 1
- 21, 22 Fault value 2

- Supply voltage + 230 V

Lambda Transmitter LT4

Notes.

Notes.

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