



TA 1000-0310

Technical Instruction

Fuel gas sampling using Tedlar bags



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1 Introduction

This manual describes fuel gas sampling using gas sampling bags. The manual contains general instructions which apply to the sampling of natural gas and special gases, and special instructions which apply to the sampling of special gases.

2 Required sampling equipment

The following equipment is required for sampling:

- Sampling valve (if possible stainless steel or nickel-plated brass).
- Short, clean PTFE (Teflon) sampling hose ; 1/4" dia. x 1 mm or 6 dia. x 1 mm, max. 0.5 m long.
- Adapter to connect the sample bag.
- Tedlar sample bag

And for biogas, sludge gas, landfill gas and special gas installations:

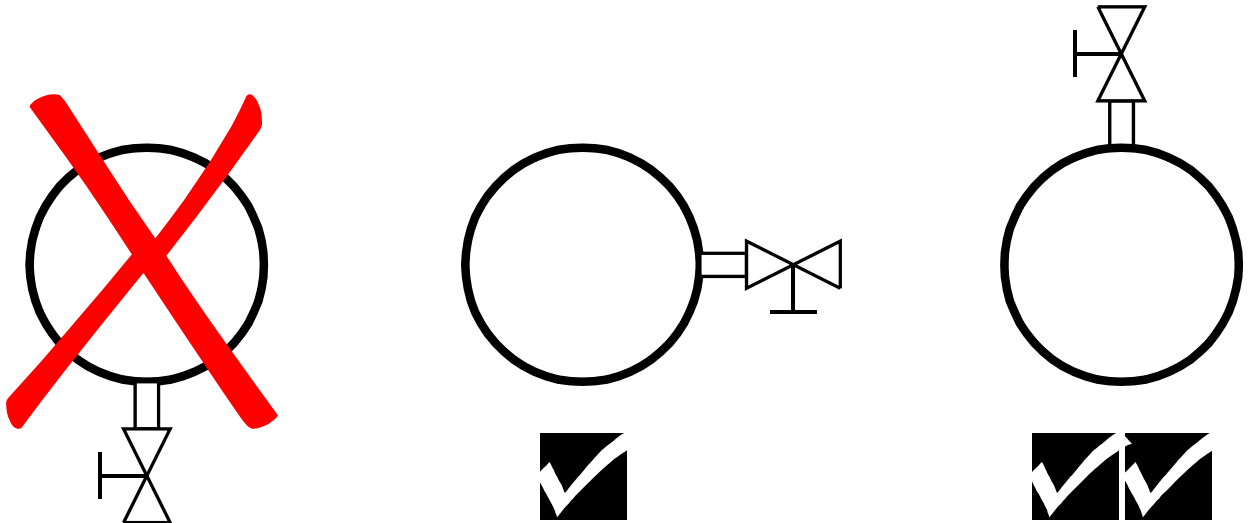
- pressure gauge
- temperature and moisture measuring equipment.

3 Requirements for sampling and the selection of the sampling location

- The sampling location must be in a part of the gas line with a constant gas flow and must be free of condensate. Up or downward pipe sections are well suited for this purpose. In the case of horizontal pipe sections, the sampling location must branch upward or sideways (see the Figure below), otherwise condensate will collect in the branches.



The condensate would affect the sampling result even if it was drained before sampling and the gas is visually dry.



Sampling locations in horizontal pipe sections

- b) The fuel gas supply must have been running continuously for at least three (3) hours. The gas volume flow must be at least 75% of the operational gas flow that would be needed when the planned gas engine system was operating at full load. If required, excess gas burners (flares) must be activated. During this period, landfill gas plants require the suction pressure to be approximately the same as the suction pressure during the planned full-load operation. In the case of landfill gas installations, suitable samples can only be taken in a gas collecting line. Sampling from individual gas sources will not lead to suitable results.

Any deviations from these requirements must be indicated in the sampling protocol!

i In the case of gas lines having a reduced flow during sampling there is the risk of a faulty measurement when trace components condense on cold surfaces and/or when silicon-organic compounds are absorbed in other condensed trace components.

- c) The sampling location must preferably be located in the pressurised part of the fuel gas line before the projected engine.
- d) The gas temperature in the gas line must be $< 50\text{ }^{\circ}\text{C}$.

i In cases where the ambient temperature is much lower than the gas temperature in the gas line, you must heat the sampling fittings to a temperature of approx. $30\text{ }^{\circ}\text{C}$ to prevent condensate from forming. This applies also for sampling fittings which have been exposed to low temperatures during the transport to the sampling location.

- e) In order to ensure that the trace element load in the fuel gas is as consistent as possible, none of the settings of the operational gas plant should be altered during sampling.
- f) All fittings coming into contact with the sample gas must be stainless steel or nickel-plated brass. The hose connecting the sampling location and the Tedlar bag must be PTFE (Teflon). The hose must not be made of other plastics or silicon-containing material. The surface coming into contact with the gas must be as small as possible and must be free of deposits (dirt, condensate).

i The hoses used must avoid reactions with the trace components in the gas as far as possible to minimise absorption, adsorption and carrying-over effects. For the same reason, the sampling hose must be kept as short as possible. PTFE hoses will probably have the least effect on the trace components in the gas.

4 Sampling

- a) Complete items A to D in the enclosed protocol.
- b) Check the bag for possible damage. Ensure that the threaded connection of the septum (brown knurled [thumb] screw) is closed hand-tight.

- i** In general, new bags need not be flushed before use. If you suspect that the bag contains gas residues, you must fill and subsequently empty the bag three times with the sample gas in order to flush it. When emptying the bag, make sure to smooth it out on a flat surface without folding or rolling it up.
- c) Mark the bag clearly before filling. Enter the marking in the protocol (item A).
- d) Connect the PTFE sample hose to the fuel gas line sampling valve. Make sure to flush both the hose and the adapter with the sample gas for approx. one minute. Subsequently, reduce the gas flow so that only a very small amount of gas is discharged.
- i** If the gas sampling location is situated near gas alarm systems or in surroundings in which there is a risk of explosion, you must ensure that the flushing gas is expelled safely. Do not use a pump to fill the sample bag.
- e) Hold the adapter in front of the Tedlar bag and flush the valve outlet, then slide the adapter over the valve outlet. The connection must be gas-tight. Slowly open the bag valve by no more than one turn while holding the valve outlet to keep the mechanical load of the bag to a minimum.
- i** During sampling, the bags must not be filled by more than 70 %. Bags must never be filled to their maximum capacity, in order to ensure that the bag does not explode if the gas expands due to temperature increases or pressure variations.
- f) Having filled the bag to approx. 70 %, you must first close the bag valve and then the fuel gas line valve.
- i** Ensure that you complete the enclosed protocol in full!

5 Sending the sample bags

The samples must be sent to a specialist laboratory as soon as possible. When selecting the packaging material, ensure that when opening/cutting open the packaging, the sample bags cannot be punctured accidentally. Also ensure that the bag can expand if the gas expands due to temperature increases or pressure variations. Do not fold the bags!

6 Tips

6.1 part number

The part number for the Tedlar bags is:	Part. No. 384728 (1 litres), VE 10 pcs.
	Part. No. 384729 (10 litres), VE 10 pcs.

6.2 Explanation of sampling protocol

- Indicate the sampling location clearly, e.g. after the compressor and before the engine, or after the compressor and before the activated carbon adsorber, etc.
- Measure the gas temperature inside the gas line. Measurements taken on the outside surface of the gas line are not precise.
- If possible, always measure the gas moisture content because - just as the gas temperature - these data are required to determine whether or not a gas cleaning installation is required.
- External conditions such as weather, precipitation, sun rays all have a direct influence on external gas lines. Any details of these conditions will help interpret the measurement readings. Heavy precipitation, especially during the last few days before measurement, can, for example, have a strong diluting effect on the discharge to purification installations. In case of non-covered landfills, such conditions will directly affect gas production. If possible, always contact the operating staff.

- Do not store the sample tubes in your car at high outside temperatures. Send them asap. Ensure the samples are stored in a cool place if immediate dispatch is not possible, e.g. sampling during weekends.

7 Appendix:

Sampling protocol (for INNIO Jenbacher GmbH & Co OG)

A: Order data and scope of analysis

Gas type: Natural gas Propane Landfill gas Sludge gas Biogas Wood gas Special gas

Sample identification + date

Hu determination (1 litre Tedlar sample bag and/or as agreed)

Standard analysis (1 litre Tedlar sample bag and/or as agreed)

Standard analysis + Wickbold (10 litre Tedlar sample bag and/or as agreed)

Contact person to whom the analysis results are to be sent:

Name

Company/address

Telephone No.

Fax No.

E-mail

B: General data

Sample taken by:

Name

Sample taken by:

Company

Telephone No.

Plant:

Name / Identification

Unit number

P_{el}

Engine type(s)

Number

Gas type(s)

Contact person

Telephone No.

C: Sampling location (all data refer to the fuel gas in the gas line)

Requirements: Free from condensate, sampling location is part of the gas line with a constant gas flow, sampling valves must have reached gas temperature, if required, these should be heated

In between which installation components is the sampling location situated? _____

For bio-gas, sludge gas, landfill gas and special gas installations:

Excess gas pressure [mbar] _____ Gas temperature in the gas line [°C] _____

Relative gas moisture [%] _____ Dew point temperature [°C] _____

D: Ambient conditions (for container-based installations or gas conditioning in case of outside arrangement)

Ambient temperature [°C] _____ Weather _____

Precipitation _____

Precipitation in the last few days (if data available) _____

Direct sun rays on gas lines? For how long? _____

E: Sending of samples

Transported by the person that took the sample _____ yes _____ No

Courier/express parcel service _____

Do not expose sample bags to direct sunlight!

F: Remarks

Sampling report sheet (for the laboratory)

Order data and scope of analysis

Gas type: Natural gas Propane Landfill gas Sludge gas Biogas Wood gas Special gas

Sample identification + date _____

Hu determination _____ (1 litre Tedlar sample bag and/or as agreed)*

Standard analysis (1 litre Tedlar sample bag and/or as agreed)*
Standard analysis + Wickbold (10 litre Tedlar sample bag and/or as agreed)*

Contact person to whom the analysis results are to
be sent:

Name

Company/address

Telephone No.

Fax No.

E-mail

**Make sure to discuss the assignment/test range with the relevant laboratory in advance. Also
make clear that the lead times for the tests must be kept to an absolute minimum.**

*Description applies to analysis by:

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8 Revision code

Revision history

Index	Date	Description / Revision summary	Expert <i>Auditor</i>
2	30.04.2019	GE durch INNIO ersetzt / GE replaced by INNIO	Stojiljkovic T. <i>Pichler R.</i>
1	31.05.2010	Umstellung auf CMS / Change to Content Management System ersetzt / replaced Index: -	Provin <i>Provin</i>