

**Ordinance on Environmentally Compatible Storage of Waste from Human Settlements**

**(Abfallablagungsverordnung – AbfAbIV)**

of 20 February 2001

last amended by Article 1 of the Ordinance for implementation of the Council decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills of 13. December 2006 (Federal Law Gazette I 2006 p. 2860)

**(unofficial text)**

**Article 1 Scope of application**

(1) This Ordinance shall apply to

1. the storage of waste from human settlements, and of waste that can be managed like waste from human settlements, in landfills and
2. the treatment of waste from human settlements, and of waste that can be managed like waste from human settlements, for the purpose of compliance with landfill-allocation criteria.

(2) This Ordinance shall apply to

1. operators and owners of landfills (landfill operators),
2. operators of facilities for treatment of waste from human settlements and of waste within the meaning of Article 2 No. 2 and
3. owners of waste from human settlements and of waste within the meaning of Article 2 No. 2 for disposal.

(3) This Ordinance shall not apply to private households.

(4) The principles and basic obligations of closed-substance-cycle economies, pursuant to Articles 4 and 5 Closed Substance Cycle and Waste Management Act, shall not be affected.

**Article 2 Definitions of terms**

For the purposes of this Ordinance, the following definitions of terms shall apply:

1. Waste from human settlements:  
domestic waste and other waste that, due to its nature or composition, is similar to domestic waste.
2. Waste that can be managed like waste from human settlements:  
waste that, due to its nature or composition, may be managed together with waste from human settlements, or may be managed like such waste, especially sewage sludges from wastewater-treatment facilities for treatment of municipal wastewater or of wastewater with similarly low pollutant contamination, faeces, faecal sludge, residues from wastewater facilities, water-purification sludges, building waste and production-specific waste. This shall also include waste from treatment of waste from human settlements and of waste pursuant to the 1<sup>st</sup> sentence.
3. Waste with high thermal value:  
waste that, in mechanical or mechanical-biological treatment of waste from human settlements, and of

waste within the meaning of Article 2 No. 2, is separated, has a considerably higher thermal value than waste subjected to treatment and can be used for energy recovery.

4. Mechanical-biological treatment:  
processing or conversion of waste from human settlements, and of waste within the meaning of Article 2 No. 2 with biologically degradable organic components, via a combination of mechanical and other physical processes (for example, cutting or crushing, sorting) with biological processes (rotting, fermentation).
5. Landfill:  
waste-management facility for the storage of waste above the earth's surface (above-ground landfill).
6. Landfill section:  
separately operated area of a landfill. Landfill sections may overlap only in embankment areas.
7. Old landfill:
  - a. landfill under construction or in operation, or a landfill section under construction or in operation, whose construction and operation were permitted on 1 June 1993 or which were permissible pursuant to Article 35 Closed Substance Cycle and Waste Management Act and
  - b. landfills for the permitting of which, as of 1 June 1993, a plan-approval procedure had been initiated and the relevant public notification had been provided.
8. Landfill class I:  
landfill for waste that contains a very small organic component and that exhibits very low pollutant release in leaching testing.
9. Landfill class II:  
landfill for waste, including mechanically and biologically treated waste, that has a larger organic component than waste that may be stored in Class I landfills, and in which the pollutant release in leaching testing is greater than that for landfill class I and, as compensation, is subject to stricter requirements for the landfill site and landfill sealing.
10. TA Siedlungsabfall:  
The Third General Administrative Provision on the Waste Avoidance and Waste Management Act (TA Siedlungsabfall) of 14 May 1993 (Federal Gazette No. 99a).
11. Basic characterisation:  
Determination and assessment of all information required for safe long-term waste disposal, such as information about the type, origin, composition, consistency and leachability of the waste, about other characteristic properties of the waste and about the waste's likely behaviour in landfills, along with determination of critical parameters and of the frequency with which they are to be checked.
12. Critical parameters:  
Parameters of central importance for review, as required in the framework of compliance testing, of the permissibility of disposal in the relevant landfill and of the waste's conformance to the basic waste characterisation concerned.

### **Article 3      General requirements pertaining to storage**

- (1) Waste from human settlements, and waste within the meaning of Article 2 No. 2, may be stored only in landfills or landfill sections that comply with the requirements for landfill class I or II. The requirements are defined in accordance with Number 10 of the TA Siedlungsabfall.
- (2) Slightly polluted mineral waste may also be stored in landfills or landfill sections (landfills for building rubble and excavated soil) that do not fully comply with requirements for landfill class I specified in paragraph 1.
- (3) Waste from human settlements, and waste within the meaning of Article 2 No. 2, with the exception of mechanically and biologically treated waste, may be stored only if it complies with the relevant allocation criteria of Annex 1 for landfill class I or II.
- (4) Mixing of different wastes with each other, or with other materials, in order to achieve compliance with the allocation criteria of Annex 1 for the relevant landfill class, shall not be permitted. This shall not apply to allocation criterion Number 1 (strength).
- (5) Waste that could impair the public interest if stored, due to its content of long-lived or bio-accumulable toxic substances, in keeping with its origin or nature, shall not, in general, be allocated to an above-ground landfill.

### **Article 4      Requirements pertaining to storage of mechanically and biologically treated waste**

- (1) Mechanically and biologically treated waste may be stored only if
  1. the storage takes place in landfills or landfill sections that meet the requirements for landfill class II,
  2. the waste fulfils the allocation criteria of Annex 2 for landfill class II,
  3. the waste is not mixed in order to achieve compliance with the allocation criteria of Annex 2, and storage on top of already stored waste with a large biologically degradable component (for example, untreated domestic waste) would not lead to impairment of gas collection from such waste, and infiltration of water, for maintenance of biological decomposition processes in such waste, is technically possible or unnecessary, and there is no uncontrolled gas release, and
  4. within the framework of mechanical-biological treatment, waste with high thermal value for recovery or thermal treatment, and other recoverable or pollutant-containing fractions, are separated.

In the cases of the 1<sup>st</sup> sentence no. 1, the requirements pursuant to Number 10 of the TA Siedlungsabfall are defined.

- (2) In order to ensure proper storage of mechanically and biologically treated waste, the landfill operator shall
  1. comply with the requirements of Annex 3 pertaining to landfilling of mechanically and biologically treated waste and
  2. ensure that, after a landfill section has been filled, minor emissions of landfill gas that occur are oxidised before they are released into the atmosphere; on request, monitoring reports from the external control activity pursuant to Annex C No. 6 3<sup>rd</sup> sentence TA Siedlungsabfall, on remaining gas emissions, shall be submitted to the competent authority.

### **Article 5      Obligations pertaining to checks and submission of proof**

(1) Before accepting a waste for the first time, the landfill operator shall carry out basic characterisation of the waste and shall determine its critical parameters. The waste producer, or the collector, in cases of joint waste disposal, shall furnish the landfill operator, promptly and prior to the first delivery of the producer's or collector's waste, except where waste pursuant to Article 8 (8) of the Landfill Ordinance (Deponieverordnung) is concerned, with at least the following information:

1. A description of any pre-treatment that has been carried out,
2. Information in keeping with the contents of the Declaration of Responsibility (Form VE pursuant to the provisions of the Ordinance on waste recovery and disposal records (Nachweisverordnung)), including results of analysis of compliance with the allocation criteria of Annex 1 or 2 for the relevant landfill class,
3. In the case of hazardous waste, information in keeping with the contents of the Declaration Analysis (Form DA pursuant to the provisions of the Ordinance on waste recovery and disposal records (Nachweisverordnung)), and information regarding the total content of storage-relevant ingredients in the solid matter, where such information is required to assess the permissibility of landfill disposal, except in the case of waste pursuant to Article 8 (1) 4th Sentence of the Landfill Ordinance (Deponieverordnung),
4. In the case of hazardous waste, and in the case of mirror entries, also the relevant hazardous properties of the waste, and
5. A proposal for naming the critical parameters.

In the case of mechanically and biologically treated waste that is delivered regularly and in large quantities, the critical parameters pursuant to Sentence 2 No. 5 must include at least the parameters "organic component of dry residue in original substance", determined as TOC (No. 2 of Annex 2) or gross calorific value  $H_o$  (No. 6 of Annex 2); DOC in the eluate (Nr. 4.03 of Annex 2); and "biological degradability of dry residue in original substance", determined as breathing activity  $AT_4$  (No. 5 of Annex 2), or determined as gas-formation rate in the fermentation test  $GB_{21}$  (No. 5 of Annex 2). Tests for a basic characterisation pursuant to Sentence 1 are not required if all necessary information relative to the waste's leaching behaviour and composition are known and if relevant proof has been provided to the competent authority. The waste tests pursuant to Sentence 2 No. 2 are to be carried out in keeping with Annex 4. Where changes in the waste-generation process lead to significant changes in the waste's leaching behaviour or composition, the waste producer, or the waste collector, in cases of joint waste disposal, shall provide the required information pursuant to Sentence 2.

(2) Upon each delivery of waste, the landfill operator shall carry out an acceptance check, without delay, that shall include a visual inspection pursuant to Sentence 2 and determination of the relevant weight and waste type, including the waste key. In the visual inspection, the waste must be inspected with regard to appearance, consistency, colour and odour. In justified cases, the visual inspection may also be carried out during landfilling of the waste.

(3) The landfill operator shall carry out a compliance analysis if the visual inspection provides indications that the waste does not comply with the required characteristics for the planned landfilling, or indications of discrepancies between the accompanying documents and the delivered waste. In addition, the landfill operator

shall carry out a compliance analysis on a random-sample basis, and at least once yearly if waste is delivered regularly, and per each commenced 2000 megagrams if large amounts of waste are delivered from waste-treatment facilities, with such analysis designed to check for compliance with the relevant allocation criteria of Annex 1 or of Annex 2. The compliance analysis must cover at least the critical parameters pursuant to Para. 1. The compliance analysis must be carried out pursuant to Annex 4. Where the basic waste characterisation pursuant to Para. 1 Sentence 4 does not necessitate any tests, the random-sample compliance analysis pursuant to Sentence 2 is not required. In such cases, the waste must be checked for agreement with the other information provided by the basic characterisation.

(4) When compliance analyses are carried out, pertinent control samples must be taken for storage and then stored for at least one month.

(5) The landfill operator must inform the competent authority without delay regarding any delivered waste for which storage in the landfill is not permitted. The landfill operator has the right to refuse acceptance of non-permitted waste.

(6) The results of the visual inspections pursuant to Para. 2 and of the compliance analyses pursuant to Para. 3,

and the information pursuant to Para. 5, must be entered into the landfill's operations record and presented to the competent authority upon request.

(7) Operators of landfills in which mechanically and biologically treated waste is stored shall keep records, for each working day, of compliance with the requirements set forth in Annex 3 relative to waste storage and landfill operations. The required tests must be carried out in accordance with Annex 4. The records must be entered into the landfill's daily operations record and presented to the competent authority upon request.

#### **Article 6 Transitional provisions**

(1) Until 31 May 2001, excavated soil, building rubble and other mineral waste may be stored even if waste requirements pursuant to Annex 1 are not met. Such storage should take place in old landfills, even where such landfills do not meet the requirements of Article 3 (1), while meeting at least the requirements pursuant to Number 11 of the TA Siedlungsabfall, or should take place in separate sections of landfills of class I or II.

(2) Upon application of the landfill operator, the competent authority, under conditions pursuant to paragraph 3, may permit the following:

1. Domestic waste, commercial waste similar to domestic waste, sewage sludges and other waste with large organic components may be stored even if the waste requirements pursuant to Annex 1 or Annex 2 are not met. Such storage should take place in old landfills (landfills for domestic waste), even where such landfills do not meet the requirements of Article 3 (1), while meeting at least the requirements pursuant to Number 11 of the TA Siedlungsabfall, or should take place in separate sections of landfills of class II. Such permits shall be made to expire no later than 31 May 2005.
2. Waste from human settlements, and waste within the meaning of Article 2 No. 2, that fulfils the landfill-allocation criteria of landfill class I pursuant to Annex 1, may be stored in old landfills that do not meet the requirements of Article 3 (1), while meeting at least the requirements pursuant to Number 11 of the TA Siedlungsabfall. Relevant permits shall be made to expire no later than 15 July 2009.
3. Waste from human settlements, and waste within the meaning of Article 2 No. 2, the fulfils the landfill-allocation criteria of landfill class II, pursuant to Annex 1, or mechanically and biologically pre-treated waste that fulfils the landfill-allocation criteria of Annex 2, may be stored in old landfills (landfills for domestic waste), or in separate landfill sections, if the requirements of Article 3 (1) of landfill class II, except for Numbers 10.3.1 and 10.3.2 of the TA Siedlungsabfall, are met and the requirements pursuant to Number 11 of the TA Siedlungsabfall are met. Relevant permits shall be made to expire no later than 15 July 2009. In individual cases, the permit-expiration requirement may be waived if proof is provided that the protection aims pursuant to Numbers 10.3.1 and 10.3.2 of the TA Siedlungsabfall have been achieved through other equally effective technical protection measures and the public interest – seen in terms of the requirements of this Ordinance – is not impaired.

For the period until 31 May 2005, Number 1 shall apply mutatis mutandis to the technical requirements for landfills.

(3) The exceptions mentioned in paragraph 2 may be permitted only if the public interest is not impaired and if

1. in cases pertaining to Paragraph 2 No. 1, use of existing treatment capacities cannot be reasonably expected and
2. in cases pertaining to Paragraph 2 Nos. 2 and 3, use of landfills that meet the requirements in Article 3 (1) cannot be reasonably expected.

(4) An exemption from allocation of waste to landfills, permitted by the competent authority and issued prior to the entry into force of this Ordinance pursuant to Number 12.1 1<sup>st</sup> and 2<sup>nd</sup> sentence letter a of the TA Siedlungsabfall, shall apply to domestic waste, commercial waste similar to domestic waste, sewage sludges and other waste with large organic components, as a permit within the meaning of Paragraph 2 No. 1 pursuant to this Ordinance until no later than 1 June 2005.

#### **Article 7 Administrative offences**

An administrative offence within the meaning of Article 61 (1) No. 5 of the Closed Substance Cycle and Waste Management Act shall be deemed to have been committed by anyone who, wilfully or negligently

1. in contravention of Article 3 (1) 1<sup>st</sup> sentence, paragraph 3 or 4 1<sup>st</sup> sentence or Article 4 (1) 1<sup>st</sup> sentence, stores or mixes waste,
2. in contravention of Article 4 (2) No. 1, does not comply with a listed requirement,
3. in contravention of Article 4 (2) No. 2 1<sup>st</sup> half-sentence, does not ensure that remaining emissions of landfill gas are oxidised before escaping into the atmosphere or
4. in contravention of Article 5 (2) 1<sup>st</sup> sentence or (3) 1<sup>st</sup> and 2<sup>nd</sup> sentences, does not carry out an acceptance check or a compliance analysis, does not carry out such check or analysis correctly, does not carry out such check or analysis completely, or does not carry out such check or analysis on time.

#### **Annexes:**

Annex 1: Allocation criteria for landfills

Annex 2: Allocation criteria for landfills for mechanically and biologically pre-treated waste

Annex 3: Requirements pertaining to storage and landfill operation

Annex 4: Sampling and analysis procedures

## Annex 1

### Allocation criteria for landfills

Allocation of waste to Class I or Class II landfills must comply with the allocation criteria set forth in the following table. Where the competent authority pursuant to Article 6 (3) in conjunction with Art. 6 (5) of the Landfill Ordinance (Deponieverordnung) may permit, in individual cases, allocation values that exceed those set forth in the following table, for storage of stable, inert mass waste of a specified type, in a Class I or II landfill, such allocation values may not be greater than three times the relevant applicable allocation value for Class II landfills. Excessive values pursuant to sentence 2 are not permitted for the TOC (No. 2.02) and DOC (No. 4.03) parameters, except in cases for which the table's footnotes state that excessive values are permitted. In cases pursuant to sentence 2, the waste must have a pH value between 6 and 13 in the eluate; footnote 7 of the table is not applicable for pH values < 6. The restriction to three times the allocation value, as set forth in sentence 2, does not apply to the parameters ignition loss (no. 2.01), extractable lipophile substances (no.3), chromium-VI (no. 4.08), ammonium-N (no. 4.14), cyanide (no. 4.15), AOX (no. 4.16). Additional parameters, as well as the applicable total solid-matter concentrations for the parameters, may be defined with regard to waste type, pre-treatment steps and special storage conditions. The restrictions pursuant to sentences 2 and 3 do not apply if the competent authority pursuant to Article 6 (5) Landfill Ordinance permits excessive allocation values for storage of non-hazardous mass waste of a specified type in Class I or II landfills and if only non-hazardous waste has been stored at the relevant landfill or landfill section since 16 July 2005. Annex 4 of this Ordinance must be taken into account in connection with taking, preparation and testing of samples.

No.	Parameter	Allocation values	
		Landfill class I	Landfill class II
<b>1</b>	<b>Strength<sup>1)</sup></b>		
1.01	Vane shear strength	≥ 25 kN/m <sup>2</sup>	≥ 25 kN/m <sup>2</sup>
1.02	Axial deformation	≤ 20%	≤ 20 %
1.03	Uniaxial compressive strength	≥ 50 kN/m <sup>2</sup>	≥ 50 kN/m <sup>2</sup>
<b>2</b>	<b>Organic component of dry residue in original substance<sup>2)3)4)</sup></b>		
2.01	Determined as ignition loss	≤ 3 % by weight	≤ 5 % by weight <sup>5)12)</sup>
2.02	Determined as TOC	≤ 1 % by weight	≤ 3 % by weight <sup>5)12)</sup>
<b>3</b>	<b>Extractable lipophile substances in original substance<sup>6)</sup></b>	≤ 0.4 % by weight	≤ 0.8 % by weight
<b>4</b>	<b>Eluate criteria</b>		
4.01	pH value <sup>7)</sup>	5.5-13.0	5.5-13.0
4.02	Conductance	≤ 10,000 μS/cm	≤ 50,000 μS/cm
4.03	DOC <sup>8)</sup>	≤ 50 mg/l <sup>9)</sup>	≤ 80 mg/l <sup>10)</sup>
4.04	Phenols	≤ 0.2 mg/l	≤ 50 mg/l
4.05	Arsenic	≤ 0.2 mg/l	≤ 0.2 mg/l <sup>11)</sup>
4.06	Lead	≤ 0.2 mg/l	≤ 1 mg/l
4.07	Cadmium	≤ 0.05 mg/l	≤ 0.1 mg/l
4.08	Chromium(VI)	≤ 0.05 mg/l	≤ 0.1 mg/l <sup>12)</sup>
4.09	Copper	≤ 1 mg/l	≤ 5 mg/l
4.10	Nickel	≤ 0.2 mg/l	≤ 1 mg/l
4.11	Mercury	≤ 0.005 mg/l	≤ 0.02 mg/l

4.12	Zinc	≤ 2 mg/l	≤ 5 mg/l
4.13	Fluoride	≤ 5 mg/l	≤ 15 mg/l <sup>13)</sup>
4.14	Ammonium-N	≤ 4 mg/l	≤ 200 mg/l
4.15	Cyanide, easily released	≤ 0.1 mg/l	≤ 0.5 mg/l
4.16	AOX	≤ 0.3 mg/l	≤ 1.5 mg/l
4.17	Water-soluble component (evaporation residue) <sup>14)</sup>	≤ 3 % by weight	≤ 6 % by weight
4.18	Barium	≤ 5 mg/l <sup>15)</sup>	≤ 10 mg/l <sup>15)</sup>
4.19	Chromium, total	≤ 0.3 mg/l <sup>15)</sup>	≤ 1 mg/l <sup>15)</sup>
4.20	Molybdenum	≤ 0.3 mg/l <sup>15)</sup>	≤ 1 mg/l <sup>15)</sup>
4.21	Antimony	≤ 0.03 mg/l <sup>15)</sup>	≤ 0.07 mg/l <sup>15)</sup>
4.22	Selenium	≤ 0.03 mg/l <sup>15)</sup>	≤ 0.05 mg/l <sup>15)</sup>
4.23	Chloride <sup>14)</sup>	≤ 1,500 mg/l <sup>15)</sup>	≤ 1,500 mg/l <sup>15)</sup>
4.24	Sulphate <sup>14)</sup>	≤ 2,000 mg/l <sup>15)</sup>	≤ 2,000 mg/l <sup>15)</sup>

- 1) 1.02 may, together with 1.03, be applied in equivalence to 1.01. Strength must in each case be defined separately in accordance with the static requirements on landfill stability. Particularly in the case of cohesive, finely grained waste, it shall not be permissible to fall short of the values indicated for 1.02 in conjunction with 1.03.
- 2) 2.01 may be applied in equivalence to 2.02.
- 3) Values in excess of the solid-material TOC are permitted, to a level of 5% by weight, for the following waste types, under the condition that such values in excess are not due to waste components that lead to considerable landfill-gas formation: excavated soil; waste with a gypsum basis; fibre-reinforced cements; mineral building waste with slight amounts of extraneous components; old sand from foundries; road rubble with an asphalt basis; slags; waste of similar composition. Values in excess of the solid-material TOC, to levels greater than an additional 5% by weight, are permitted under the conditions that allocation value number 4.03 (DOC) is complied with and the landfill operator proves to the competent authority that the public interest – in terms of the requirements of the Landfill Ordinance and of those of this Ordinance – is not impaired. Waste storage is permitted only if the level of biological degradability of the dry residue of the original substance (parameter number 5 pursuant to Annex 2 of this Ordinance) is less than the required level or if the measured organic component of the dry residue of the original substance, measured as TOC, is the result of elementary carbon, and if, in both cases, the gross caloric value of the waste does not exceed 6000 kJ/kg.
- 4) Does not apply to waste from high-temperature processes, such as waste from processing of slag, unprocessed slags, dusts and sludges from scrubbing of exhaust gases from sinter plants, blast furnaces, shaft furnaces and steel mills of the iron and steel industry.
- 5) Does not apply to ash and dusts from coal-fired combustion systems not subject to licensing pursuant to the Federal Immission Control Act (BImSchG).
- 6) Does not apply to road rubble with an asphalt basis.
- 7) Divergent pH values do not constitute an exclusion criterion in and of themselves. In cases of higher or lower values, testing should be carried out to determine the reason for the divergence.
- 8) The allocation value for DOC shall also be considered complied with if the waste complies with the allocation value not for its own pH value, but for a pH value between 7.5 and 8.0.
- 9) Does not apply to waste with a gypsum basis that is stored in landfills of landfill class I.
- 10) Values in excess of the DOC concentration, to no more than 100 mg/l, are permitted, subject to the consent of the competent authority, if the public interest is not impaired.
- 11) Values in excess of the arsenic concentration, to no more than 0.5 mg/l, are permitted, subject to the consent of the competent authority, if the public interest is not impaired.
- 12) Does not apply to ash from facilities for combustion of wood pursuant to the First Ordinance on the Implementation of the Federal Immission Control Act and pursuant to Number 1.2 a) and 8.2 of the Annex to the Fourth Ordinance on the Implementation of the Federal Immission Control Act.
- 13) Values in excess of the fluoride concentration, to no more than 25 mg/l, are permitted, subject to the consent of the competent authority, if the public interest is not impaired.
- 14) Number 4.17 (water-soluble component) may be applied instead of number 4.23 (chloride) and number 4.24 (sulphate).
- 15) Does not apply if only non-hazardous waste has been stored at the relevant landfill or landfill section since 16 July 2005. Also does not apply if asbestos-containing waste and waste containing hazardous mineral fibres has been stored.

**Allocation criteria for landfills for mechanically and biologically treated waste**

In allocation of mechanically and biologically treated waste to landfills, the following allocation values shall be complied with:

No.	Parameter	Allocation values
<b>1</b>	<b>Strength<sup>1)</sup></b>	
<b>2</b>	<b>Organic component of dry residue in original substance<sup>2)</sup>, determined as TOC</b>	≤ 18 % by weight
<b>3</b>	<b>Extractable lipophile substances in original substance</b>	≤ 0.8 % by weight
<b>4</b>	<b>Eluate criteria</b>	
4.01	pH value	5.5-13.0
4.02	Conductance	≤ 50,000 μS/cm
4.03	DOC	≤ 300 mg/l
4.04	Phenols	≤ 50 mg/l
4.05	Arsenic	≤ 0.5 mg/l
4.06	Lead	≤ 1 mg/l
4.07	Cadmium	≤ 0.1 mg/l
4.08	Chromium(VI)	≤ 0.1 mg/l
4.09	Copper	≤ 5 mg/l
4.10	Nickel	≤ 1 mg/l
4.11	Mercury	≤ 0.02 mg/l
4.12	Zinc	≤ 5 mg/l
4.13	Fluoride	≤ 25 mg/l
4.14	Ammonium-N	≤ 200 mg/l
4.15	Cyanide, easily released	≤ 0.5 mg/l
4.16	AND/OR	≤ 1.5 mg/l
4.17	Water-soluble component (evaporation residue)	≤ 6 % by weight
<b>5</b>	<b>Biological degradability of dry residue in original substance</b> determined as breathing activity (Atmungsaktivität - AT <sub>4</sub> ) or determined as gas-formation rate (GB <sub>21</sub> )	≤ 5 mg /g <sup>3)</sup> ≤ 20 l/kg <sup>4)</sup>
<b>6</b>	<b>Gross calorific value (H<sub>0</sub>)<sup>2)</sup></b>	≤ 6,000 kJ/kg

<sup>1)</sup> The strength is to be determined in accordance with Annex 4 No. 3.1.4.

<sup>2)</sup> 2 may be applied in equivalence to 6.

<sup>3)</sup> mg O<sub>2</sub> with respect to dry weight

<sup>4)</sup> Standard litre of gas with respect to dry weight

**Requirements pertaining to landfilling of mechanically and biologically treated waste**

In keeping with the structure and mechanical properties of mechanically and biologically treated waste that meets the requirements of Annex 2, in landfilling such waste the following supplementary requirements shall be complied with, in order to ensure that the relevant landfill behaves in an environmentally compatible way:

1. Reduction of the landfilling area to the smallest size possible in landfilling operation, covering areas not being filled with suitable materials and ensuring that surface water runs off in a planned, controlled manner.
2. During working days, the landfilling area shall be shaped into a slope of between 5 and 10%. In order to ensure that precipitation water runs off in a planned, controlled manner, the surface shall be smoothed. Where necessary, additional structural measures are to be taken to minimise entry of water and moisture from precipitation.
3. In order to ensure that the body of the landfill is only slightly permeable, waste shall be landfilled via the thin-layer procedure and compressed. The maximum possible compressibility of the waste shall be achieved by optimising the waste's water content. To this end, in a test area the highest possible landfilling density (dry density) shall be determined as a function of water content (if at all possible, not over 55 % by weight, with respect to the dry weight) and applied compression energy. During landfill operations, every time that an amount totalling 5000 m<sup>3</sup> or 5000 Mg has been landfilled, proof shall be provided that at least 95% of the so-determined highest possible landfilling density has been achieved. If the waste composition changes significantly, the highest possible landfilling density shall be redetermined.
4. Mechanically and biologically treated waste may not be stored together with gypsum waste or with hazardous waste.

**Specifications pertaining to analysis (sampling, sample preparation and analysis of treated waste),  
for Annexes 1 through 3**

**1 Specialised and expert knowledge**

**1.1 Sampling**

Sampling pursuant to Article 5 of this Ordinance is to be carried out in accordance with the requirements of Number 2 of this Annex, by persons who possess the necessary expertise for carrying out sampling.

**1.2 Testing laboratories**

Testing of samples pursuant to Article 5 of this Ordinance is to be carried out by independent testing agencies accredited pursuant to DIN EN ISO/IEC 17025, or by agencies certified, subject to revocation, by the competent authority; such testing must take the requirements pursuant to Number 2 of this Annex into account.

**2. Sampling**

Taking of samples for testing purposes is to be carried out in keeping with LAGA Guideline (LAGA = Länderarbeitsgemeinschaft Abfall = States Working Group on Waste) PN 98 (last revision: 12/01). Sentence 1 notwithstanding, in the case of rock granulations, sampling is to be carried out pursuant to DIN EN 932-1 (issued November 1996).

**3. Determination of parameters**

Parameters shall be determined in accordance with the procedures described below.

Disintegration, for subsequent determination of the amount of waste components that are soluble in aqua regia, is to be carried out pursuant to DIN EN 13657 (issued January 2003), Waste characterisation. Equivalent procedures, in keeping with the best available technology, shall be permitted. The user shall furnish relevant proof of such equivalency.

**3.1 Strength (Annex 1 and 2 No. 1)**

**3.1.1. Vane shear strength (Annex 1 No. 1.01)**

DIN 4096 (issued May 1980)

**3.1.2 Axial deformation (Annex 1 No. 1.02)**

DIN 18136 (issued November 2003)

**3.1.3 Uniaxial compressive strength (Annex 1 No. 1.03)**

DIN 18136 (issued November 2003)

**3.1.4 Strength (Annex 2 No. 1)**

The strength is to be determined, by analogy with DIN 18137-3 and GDA recommendation E 3-8, as shear resistance in a direct shear test. Testing is to be carried out in a shear-box testing device with a nominal friction surface of at least 900 cm<sup>2</sup> (30 cm x 30 cm). Devices with a smaller nominal friction surface may be used only with waste components smaller than 25 mm. The waste is stored in accordance with the values from tests for creation of the compressed test

body or with the values from the storage density established in operations and from the water content established in operations. At least three individual tests, with different normal tensions, are carried out. The set load levels must cover the vertical tensions that occur in the landfill body. The feed speed should lie within the range of 0.3 to 1.0 mm/h. The test may be concluded, if a state of extensive breakage is attained, if the frictional tension remains constant for further shifting (slip state) or if the maximum possible shifting has been achieved."

**3.2 Organic component of dry residue in original substance (Annex 1 and 2 No. 2)**

**3.2.1 Ignition loss of dry residue in original substance (Annex 1 No. 2.01)**

DIN ISO 11465 (issued December 1996) Soil characteristics – determination of dry residue and water content on the basis of weight – gravimetric procedure

E DIN EN 14346 (issued September 2004) Characterisation of waste – Determination of dry residue and water content

**3.2.2 Total organic carbon (TOC) of the dry residue of the original substance (Annex 1 No. 2.02, Annex 2 No. 2)**

DIN EN 13137, issued December 2001).

**3.3 Extractable lipophile substances (Annex 1 and 2 No. 3)**

LAGA Guideline KW/04 - Determination of the hydrocarbon content of waste – Testing and analysis strategy, short designation: KW/04, last revision: 16 November 2004

**3.4 Eluate preparation for parameter determination (Annex 1 and 2 No. 4)**

DIN 12457-4 (issued January 2003)

**3.4.1 pH value of eluate (Annex 1 and 2, No. 4.01)**

DIN 38404-C5 (issued January 1984)\*

**3.4.2 Conductance of eluate (Annex 1 and 2, No. 4.02)**

DIN EN 27888 (issued November 1993)

**3.4.3 Dissolved organic carbon (DOC) in the eluate (Annex 1 and 2, No. 4.03)**

DIN EN 1484 (issued August 1997), Alternative study for a pH value between 7.5 and 8 (Annex 1 Footnote 8), Characterisation of waste – Study of leaching behaviour – Influence of the pH value following addition of acid/base; DIN CEN/TS 14429 (pre-norm, issued January 2006)

**3.4.4 Phenols in the eluate (Annex 1 and 2, No. 4.04)**

DIN 38409-H16-3 (issued June 1984)

**3.4.5 Arsenic in the eluate (Annex 1 and 2, No. 4.05)**

DIN EN ISO 11969 (issued November 1996) or

DIN EN ISO 11885 (issued April 1998)

**3.4.6 Lead in the eluate (Annex 1 and 2, No. 4.06)**

E DIN ISO 11047 (issued May 2003) or

DIN EN ISO 11885 (issued April 1998)

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\* Shall be replaced by DIN 38404-C5 (at present draft, status as at August 2005)

- 3.4.7 Cadmium in the eluate (Annex 1 and 2, No. 4.07)**  
E DIN ISO 11047 (issued May 2003) or  
DIN EN ISO 11885 (issued April 1998)
- 3.4.8 Chromium (VI) in the eluate (Annex 1 and 2, No. 4.08)**  
E DIN ISO 11047 (issued May 2003) or  
DIN EN ISO 11885 (issued April 1998)
- 3.4.9 Copper in the eluate (Annex 1 and 2, No. 4.09)**  
E DIN ISO 11047 (issued May 2003) or  
DIN EN ISO 11885 (issued April 1998)
- 3.4.10 Nickel in the eluate (Annex 1 and 2, No. 4.10)**  
E DIN ISO 11047 (issued May 2003) or  
DIN EN ISO 11885 (issued April 1998)
- 3.4.11 Mercury in the eluate (Annex 1 and 2, No. 4.11)**  
DIN EN 1483 (issued August 1997)
- 3.4.12 Zinc in the eluate (Annex 1 and 2, No. 4.12)**  
E DIN ISO 11047 (issued May 2003) or  
DIN EN ISO 11885 (issued April 1998)
- 3.4.13 Fluoride in the eluate (Annex 1 and 2, No. 4.13)**  
DIN 38405-D4-1 (issued July 1985)
- 3.4.14 Ammonium-N in the eluate (Annex 1 and 2, No. 4.14)**  
DIN EN ISO 11732 (issued May 2005)
- 3.4.15 Cyanide, easily released, in the eluate (Annex 1 and 2, No. 4.15)**  
DIN 38405-D14-2 (issued December 1988)  
Where waste contains sulphide, analysis shall be carried out in accordance with DIN 38405-D13-2 (issued February 1981)
- 3.4.16 Adsorbable organically bound halogens (AOX) in the eluate (Annex 1 and 2, No. 4.16)**  
DIN EN ISO 9562 (issued February 2005)
- 3.4.17 Water-soluble component of dry residue in original substance, determined through filtrate dry residue in the eluate (Annex 1 and 2, No. 4.17)**  
DIN 38409-H1-2 (issued January 1987)
- 3.4.18 Barium in the eluate (Annex 1 No. 4.18)**  
DIN EN ISO 11885 (issued April 1998)
- 3.4.19 Chromium, total, in the eluate (Annex 1 No. 4.19)**  
DIN EN ISO 11885 (issued April 1998)
- 3.4.20 Molybdenum in the eluate (Annex 1 No. 4.20)**  
DIN EN ISO 11885 (issued April 1998)

**3.4.21 Antimony in the eluate (Annex 1 No. 4.21)**

DIN EN ISO 11885 (issued April 1998) or  
DIN EN ISO 11969 (issued November 1996)

**3.4.22 Selenium in the eluate (Annex 1 No. 4.22)**

DIN EN ISO 11885 (issued April 1998)

**3.4.23 Chloride in the eluate (Annex 1 No. 4.23)**

DIN EN ISO 10304-2 (issued November 1996)

**3.4.24 Sulphate in the eluate (Annex 1 No. 4.24)**

DIN EN ISO 10304-2 (issued November 1996)

**3.4.25 Thallium in the eluate**

DIN 38406-26 (issued July 1997)

**3.5 Biological degradability of dry residue in original substance breathing activity (AT<sub>4</sub>) (Annex 2 No. 5)**

Breathing activity determined over the course of 4 days, in laboratory testing.

**3.5.1 Test apparatus:**

AT<sub>4</sub> shall be determined using a Sapromat, Respiromat or equivalent apparatus. All departures from the method listed below shall be documented.

**3.5.2 Temperature:**

20 ± 1°C in a temperature-controlled water bath or conditioned room.

**3.5.3 Sample storage:**

Sample preparation must be completed, and the test started, within 48 h following sampling. During this period temperatures over 4°C are permissible for no more than 24 h. If it is not possible to ensure compliance with this procedure, the sample shall be frozen, within 24 h after sampling, at – 18 to – 20 °C. Freezing of samples shall be documented in connection with evaluation. Thawing of samples must be gentle, and must last no longer than 24 h; during thawing, the temperature must not exceed 20°C.

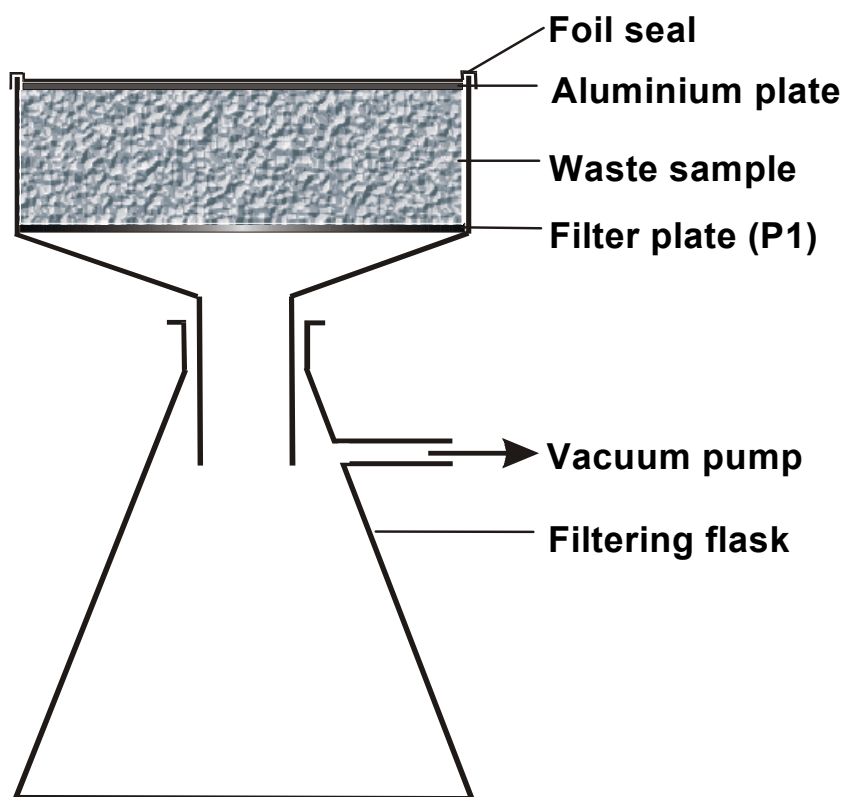
**3.5.4 Sample preparation:**

The original sample, in its entirety, must be wet-crushed to < 10 mm. If necessary, interfering substances (glass, stones and metals) may be discharged prior to crushing. Their weight components must be taken into account in evaluation of the test.

**3.5.5 Adjustment of the water content:**

Moisten 300 g of the prepared sample with 300 ml of tap water and place the wet mixture in the apparatus described in Figure 1. After covering and sealing, apply an underpressure of ca. 100,000 Pa (water-jet vacuum) and maintain for a period of 30 minutes. Determine the volume of the filtered-off water and subtract this from the added 300 ml of tap water. The amount of water determined in this manner is to be added to that part of the sample placed in the test apparatus.

If the water content of the sample to be used is larger than the determined water content, then transfer the sample, without further moistening, into the apparatus described in Figure 1, expose it for 30 minutes to the underpressure in the vacuum nutsch and then place it in the test apparatus.



**Apparatus:**

**filtering flask, vacuum-proof, volume 1 to 2 litres, with rubber plug**  
**filter nutsch, diameter 120 mm, filter plate (P1), volume 1 litre,**  
**should have vertical side walls**  
**aluminium plate, diameter the same as the inside diameter of the nutsch**  
**vacuum pump and underpressure manometer**

**Figure 1: Apparatus for adjusting the water content**

**3.5.6 Sample amount:**

A 40 g sample, adjusted to the water content determined as described above, is to be used.

**3.5.7 Number of parallel batches:**

Samples are to be tested in three parallel batches.

**3.5.8 Test duration and evaluation:**

The evaluation period is 4 days, and it begins following the initial lag phase. The lag phase has ended when the mean oxygen consumption, expressed as a 3-hour mean, reaches 25% of the value that results as the 3-hour mean in the region of the largest increase in the oxygen consumption within the first 4 days.

The weight of the oxygen consumed during the lag phase is subtracted from the weight of the oxygen consumed throughout the entire test (lag phase + 4 days), and it must not be more than 10% of the overall value. If this condition is not fulfilled, determination may not be carried out.

Measurements must be recorded on an hourly basis.

The analysis function and the 3-hour means are shown by entering the test duration (in hours) on the x-axis and the summed oxygen weights (in mg O<sub>2</sub> per g dry weight) on the y-axis.

### 3.5.9 Listing of the result:

The result is listed with two significant places, in mg O<sub>2</sub> per g dry weight. Both the mean and the standard deviation are to be listed. If one of the values of the triple determination deviates from the mean by more than 20%, then this value is to be thrown out as an outlier. In such cases, the new mean is then calculated from the 2 remaining values.

### 3.6 Gas formation (GB<sub>21</sub>) (Annex 2 No. 5)

Gas formation, determined over the course of 21 days, in laboratory testing

#### 3.6.1 General instructions:

The fermentation test is to be carried out on the basis of DIN 38414 Part 8 [DEV S8, German standardised procedures for testing of water, wastewater and sludge; sludge and sediments (Group S); determination of fermentation behaviour (S 8); Beuth Verlag GmbH; Berlin 1985] with modifications (s. No. 2.6.4 – 2.6.11). All deviations from the method described below are to be documented.

#### 3.6.2 Set-up of apparatus for testing, and gas measurement:

For these measurements, an apparatus like that shown in Figure 2 is to be used.

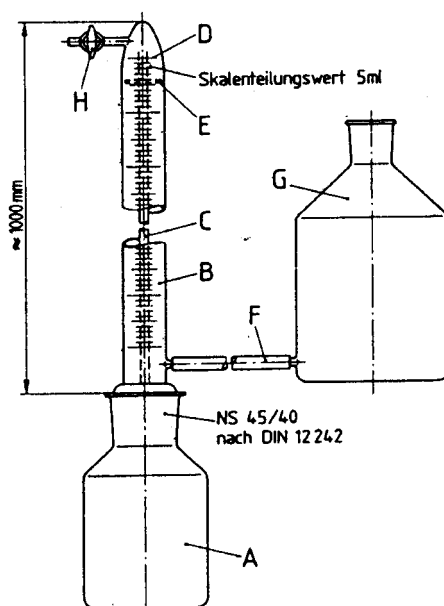
"It consists of an eudiometer tube (B) that has a volume of 300 to 400 ml and is graduated from the upper part down (scale-graduation intervals of 5 ml) and that is placed on the storage bottle (A) (which has a volume of about 500 ml) via a ground-glass connection. A connecting tube (C), which enables the fermentation gas that has developed in the storage bottle to enter the measuring tube, passes through the bottom of the eudiometer tube. The connecting tube is held in position (E) by glass rods on four sides. The lower end of the eudiometer tube has a glass hose-coupling from which a sufficiently long hose connection (F) leads to a levelling bulb (G) made of glass or plastic (volume of at least 750 ml). The upper end of the eudiometer tube is fitted with a conical stopcock (H) for removal of gas samples and for adjusting the zero point (D)." [DIN 38414 Part 8, page 3]

"Sealing liquid: 30 ml sulphuric acid, H<sub>2</sub>SO<sub>4</sub> (ρ = 1.84 g/ml), are added to 1 l of distilled water; this mixture is warmed gently and 200 g of sodium sulphate(VI) decahydrate, Na<sub>2</sub>SO<sub>4</sub> \* 10 H<sub>2</sub>O, are dissolved in it. The solution is then coloured red-orange by adding several drops of a methyl orange solution (0.1 g of methyl orange sodium salt, dissolved in 100 ml of distilled water). The sealing liquid is to be kept at room temperature. At low temperatures, sodium sulphate can crystallise out, and must then be brought back into solution via warming of the mixture." [DIN 38414 Part 8 – p. 3]

"The storage bottle (A) is ...filled with the listed..." amount of sample, inoculation sludge and water "...; the air in the bottle is displaced with nitrogen and the eudiometer tube (B) is applied. With the help of the levelling bulb (G), and the stopcock (H) of the eudiometer tube open, the level of the sealing liquid is set to the 0 mark. During this process, under no circumstances may sealing liquid ... flow over... into the connecting tube (C) and thus into ..." the sample space".

The levelling bulb should still be filled about one-quarter full. Then, the stopcock (H) is closed. The storage bottle (A) with the ... " sample mixture "...is to be kept in the dark. The generated volume of gas is then read off whenever the sealing liquid is at the same level as the eudiometer tube and the levelling bulb, after the contents of the storage bottle (A) have been carefully swirled." [DIN 38414 Part 8, page 5]

"Upon every readout of the gas volume in the eudiometer tube, the temperature and the air pressure must be measured, to permit conversion of the gas volume to the standard state. The level of the sealing liquid is set to 0 after each readout, or after several readouts – depending on how much gas is generated – with the stopcock (H) open; in the process, air must not be sucked in through the stopcock (H)." [DIN 38414 Part 8, page 5]



- A Standflasche mit Schlammprobe, Inhalt 500 ml, z. B. Standflasche DIN 12 039 – W 500
- B Eudiometerrohr, Inhalt 300 bis 400 ml, Durchmesser 30 bis 35 mm, Skalenteilungswert 5 ml
- C Verbindungsrohr, Durchmesser etwa 6 mm
- D Nullmarke
- E Haltestifte bzw. Abstandhalter oder Lochverbindung zwischen Mantel des Eudiometerrohres und Verbindungsrohr
- F Schlauchverbindung
- G Niveaugefäß, Inhalt min. 750 ml, z. B. Stutzenflasche DIN 12 037 – K 1
- H Einweg-Kegelhahn, z. B. Küken DIN 12 541 – EM 3

**Figure 2: Test apparatus for determination of the fermentation behaviour of sludges [DIN 38414 Part 8, page 6]**

[A: Storage bottle with sludge sample, volume of 500 ml – for example, DIN 12 039 – W 500 storage bottle;

B: eudiometer tube, volume of 300 to 400 ml, diameter of 30 to 35 mm, scale graduation 5 ml;

C: connecting tube, diameter of about 6 mm;

D: zero mark;

E: retaining pins or separators or hole connection between the cover of the eudiometer tube and the connecting tube;

F: hose connection;

G: levelling bulb, volume of at least 750 ml – for example, DIN 12 037 – K 1 aspirator; H: one-way conical stopcock – for example, DIN 12 541 – EM 3 plug]

### **3.6.3 Temperature**

35 ± 1°C in the temperature-controlled water bath or conditioned room [pursuant to DIN 38414 Part 8].

### **3.6.4 Sample storage:**

Sample preparation must be completed, and the test started, within 48 h following sampling. During this period temperatures over 4°C are permissible for no more than 24 h. If it is not possible to ensure compliance with this procedure, the sample shall be frozen, within 24 h after sampling, at – 18 to – 20 °C. Freezing of samples shall be documented in connection with evaluation. Thawing of samples must be gentle, and must last no longer than 24 h; during thawing, the temperature must not exceed 35°C.

### **3.6.5 Sample preparation:**

The original sample, in its entirety, must be wet-crushed to < 10 mm. If necessary, interfering substances (glass, stones and metals) may be discharged prior to crushing. Their weight components must be taken into account in evaluation of the test.

### **3.6.6 Inoculation sludge**

"Digested sludge from a municipal wastewater-treatment facility that has not been subjected to any measurable retardation during fermentation, and that has been kept for about one month under the conditions described below, is suitable as inoculation sludge. The sludge must not contain any coarse components and should develop a minimum amount of gas. It is useful to keep a considerable volume (about 10 l) of the inoculation sludge, with about 5 % dry residue, under anaerobic conditions in the closed system at (35 ± 1) °C, in order to make it possible to carry out a large number of tests simultaneously. In such cases, it must be ensured that the surrounding temperature does not fluctuate widely (for example, by covering the apparatus with a hood, etc.). A small percentage by volume (about 0.1 %) of fermentable substances, in the form of raw sludge..."may be added" every two weeks to the inoculation sludge...during further storage... The raw sludge must be free of toxic substances and should not contain any coarse components. After every such addition, the mixture should be thoroughly mixed. This inoculation sludge may not be used for the test batch until 1 week after the last addition of raw sludge." [DIN 38414 Part 8, page 4]

### **3.6.7 Sample weight:**

50 g of the prepared sample are used in the test apparatus. 50 ml of inoculation sludge are added to the sample and then the batch is filled with tap water to a level of 300 ml.

### **3.6.8 Reference batch:**

Micro-crystalline cellulose is used to control the gas formation of the inoculation sludge. For this purpose, 50 ml of inoculation sludge are added to 1 g of cellulose, and the batch is filled with tap

water to a level of 300 ml. The reference batch may be stirred throughout the entire duration of the test.

In the reference batch, a value of at least 400 NI/kg must be reached; if this is not accomplished, the results must be thrown out, and the test conditions and the inoculation sludge must be checked.

**3.6.9 pH value:**

The pH value of the test batch must be measured at the beginning and end of the test.

If the pH value falls below 6.8 or exceeds 8.2, the measurement may not be counted. If the pH value is too low or too high at the beginning of the test, and if the pH value is adjusted with an alkalising agent (caustic soda solution or caustic potash solution), or with hydrochloric acid (in order to lower the pH value), then this must be noted when the result is reported.

**3.6.10 Number of parallel batches:**

Samples are to be tested in three parallel batches.

Inoculation sludge and cellulose are to be tested in two parallel batches.

**3.6.11 Test duration and evaluation:**

Volumes of generated gas are measured by analogy with DIN 38414 Part 8, No. 10:

For each batch, Table 1 provides the model for data collection and calculation. The following equation is to be used to calculate the standard volume of the gas formed in the various individual time frames:

$$V_0 = V \cdot \frac{(p_L - p_w) \cdot T_0}{p_0 \cdot T} \quad (1) \text{ [pursuant to DIN 38414 Part 8, p. 8]}$$

$V_0$  gas volume, in ml

$V$  volume of generated gas, in ml

$p_L$  air pressure at the time of readout, in mbar

$p_w$  vapour pressure of the water at the temperature of the surrounding room, in mbar

$T_0$  standard temperature,  $T_0 = 273$  K

$p_0$  standard pressure,  $p_0 = 1013$  mbar

$T$  temperature of the gas or of the surrounding room, in K

Table 1: Model for evaluation of tests [pursuant to DIN 38414 Part 8, p. 9]

1	2	3	4	5	6	7
Date	Time	Volume of generated gas V ml	Temperature T K	Vapour pressure of the water $p_w$ mbar	Air pressure $p_L$ mbar	Standard volume $V_0$ Nml

The test log pursuant to Table 1 must be kept for every started mixture of the sample ( $V_0 \cong V_p$ ), the reference

batch ( $V_0 \cong V_R$ ) and the inoculation sludge ( $V_0 \cong V_{IS}$ ). The generated gas volume is summed step-by-step, in the readout sequence. Changes of the dead volume, due to changes in the temperature and pressure conditions between the readouts, are insignificant and thus may be neglected. [DIN 38414 Part 8]

For the purposes of further calculation, the gas volumes of the sample and of the inoculation sludge (as the arithmetic mean of the double batch) are to be entered in Table 2.

The net gas volume ( $V_N$ ) of the sample is obtained, for equal test periods, as the difference between the gas volumes of the sample and the arithmetic mean of the double batch for the inoculation sludge.

The specific gas formation  $V_S$  of der sample during the test duration is calculated step-by-step, from readout to readout, using the following equation:

$$V_s = \frac{\sum V_n \cdot 10^2}{m \cdot w_T} \quad (2) \text{ [pursuant to DIN 38414 Part 8, p. 9]}$$

$V_S$  specific volume of gas generated during the test period, with respect to the dry weight, in l/kg

$\sum V_n$  net volume of gas generated during the test duration under consideration, in ml

$m$  weight of the weighed sample, in g

$w_T$  dry weight of the sample, in %

Table 2: Model for determination of gas formation with respect to dry weight [pursuant to DIN 38414 Part 8, p. 10]

1	2	3	4	5
Test duration	Sum of standard volumes	Proportional standard volume developed from the inoculation sludge	Net gas volume of the sample (column 2 – column 3) ( $V_N$ )	Specific gas formation, with respect to the dry weight
d	$V_P$ Nml	$V_{IS}$ Nml	Nml	$V_S$ Nl/kg

The reference value for gas formation is the dry weight of the sample [Nl/kg TS].

The evaluation period lasts for 21 days and begins after the initial lag phase. The lag phase has ended when the mean gas formation, expressed as a 3-day mean, is 25 % of the value that results as the 3-day mean in the region of greatest increase of the gas-formation function within the first 21 days.

The volume of the gas formed during the lag phase is deducted from the volume of the gas formed throughout the entire duration of the test (lag phase + 21 days), and it must not be greater than 10 % of the total value. If this condition is not met, the measurement must not be counted.

Daily readouts, for every working day, should be taken until the maximum gas-formation rate has been reached.

The analysis function and the 3-hour means are shown by entering the test duration (in hours) on the x-axis and the summed gas volumes (in Nl/kg dry weight) on the y-axis.

### 3.6.12 Listing of the result:

The result is listed, with two significant places, in NI/kg of dry weight. Both the mean and the standard deviation of the triple determination are to be listed. If one of the values of the triple determination deviates from the mean by more than 20%, then this value is to be thrown out as an outlier. In such cases, the new mean is then calculated from the 2 remaining values.

The result for the reference batches must also be listed.

**3.7 Thermal value (Annex 2 No. 6)**

DIN 51900. Part 1 (issued April 2000), DIN 51900. Parts 2 and 3 (issued August 1977)

**3.8 Water content (Annex 3)**

DIN 18121, Part 1 (issued April 1998)

**3.9 Density (Annex 3)**

Density of landfilled waste, field test, DIN 18125, Part 2 (issued August 1999)

**4. Evaluation of measurements**

**4.1** For control analyses, compliance with allocation values pursuant to Annex 1 is considered achieved if the determined values do not deviate from the allocation values by more than the following amounts:

<b>Parameter</b>	<b>Maximum permissible deviation</b>
2.01 Ignition loss	50% (relative)
2.02 TOC	50% (relative)
3 Extractable lipophile substances in original substance	25% (relative)
4.01 pH value	0.5 pH units
4.02 Conductance	10% (relative)
4.03 to 4.17 Eluate criteria	in each case, 50% (relative)

**4.2** For control analyses for mechanically and biologically treated waste, the allocation values of Annex 2 are considered complied with even when a parameter exceeds one of the parameter standards listed below, if the relevant standard was complied with in the previous four control analyses (the numbers in parentheses refer to Annex 2):

- TOC (No. 2): = 21%
- DOC (Eluate, No. 4.03): = 600 mg/l
- AT<sub>4</sub> (No. 5): = 10 mg/g
- GB<sub>21</sub> (No. 5): = 30 l/kg
- Gross calorific value (No. 6): = 7000 kJ/kg

For the remaining parameters of Annex 2, Number 4.1 applies mutatis mutandis.

**5 Promulgations of expert authorities**

The expert authorities' promulgations listed in this Annex have been archived at the German Patent and Trade Mark Office in Munich.

The following have been published:

- the ISO standards, EN standards and DIN standards, published by Beuth-Verlag GmbH, Berlin and Cologne,
- LAGA Guideline PN 2/78, in the Waste Manual (*Müll-Handbuch*), Index (*Kennzahl*) 1859, issue (*Lieferung*) 2/84, Erich Schmidt Verlag, Berlin and
- LAGA Guideline KW/85 in the Waste Manual (*Müll-Handbuch*), Index (*Kennzahl*) 1867, issue (*Lieferung*) 7/93, Erich Schmidt Verlag, Berlin.
- LAGA Guideline PN 98 (last revision 12/2001), Erich Schmidt Verlag, 10785 Berlin, ISBN 3 503 07037 0,
- LAGA Guideline EW 98p, Erich Schmidt Verlag, 10785 Berlin, ISBN 3 503 07038 9,
- LAGA Guideline KW/04 (last revision 11/2004), Erich Schmidt Verlag, 10785 Berlin, ISBN 3 503 08396 0.

This Ordinance shall enter into force on 1 March 2001.