

Cyanide easily liberated

Principle

The reaction converts easily liberated cyanide into gaseous HCN (hydrogen cyanide), which passes through a membrane into the indicator cuvette. The colour change of the indicator is photometrically evaluated.

Range of Application

Waste water, process control

Storage Information

The test reagents are stable at +2 to +8°C up to the expiry date given on the package.

Interferences

The ions listed in the table have been individually checked up to the given concentrations. Cumulative effects and the influence of other ions have not been determined by us. There is no interference from:

2000 mg/L: thiocyanate (SCN⁻)

50 mg/L: nitrite (NO₂⁻), dithionite (S₂O₄²⁻)

1 mg/L: sulphide (S²⁻), thiosulphate (S₂O₃²⁻)

Higher concentrations of these ions cause **high-bias results**.

500 mg/L: cyanate (OCN⁻)

20 mg/L: disulphite (S₂O₅²⁻)

10 mg/L: copper (Cu²⁺), sulphite (SO₃²⁻)

1 mg/L: formaldehyde (HCHO)

Higher concentrations of these ions cause **low-bias results**.

Wastewater samples that have been treated with dithionite, sulphite or disulphite must be pretreated with the **CleanUp-Set LCW 923**. As well as the **CleanUp-Set LCW 923**, a **Membrane Filtration Set** is needed (**LCW 904** or **LCW 916**).

Hexacyanoferrates (up to 100 mg/L) are not detected.

Oxidizing agents (e.g. **hypochloride** or **hydrogen peroxide**) in the sample can cause low-bias results to be obtained if the sample is left to stand or is not immediately analysed.

The measurement results must be subjected to plausibility checks (dilute and/or spike the water sample).

pH/temperature

The pH of the water sample must be between pH 7 and pH 10. If this is not the case, the water sample must be adjusted to the correct pH:

- pH < 7 Add sodium hydroxide solution drop by drop until the specified pH range is reached
- pH > 10 Add sulphuric acid drop by drop until the specified pH range is reached;
the pH must not be allowed to fall below 7, as hydrocyanic acid (HCN gas) can then escape!

The temperature of the water sample and reagents must be between 15 and 25°C. The analysis should be carried out immediately after sampling.

Special note

1. Reaction times

The specified digestion and cooling times must be adhered to exactly, otherwise inaccurate results may be obtained. The sample cuvette and zero solution cuvette must have the same measurement temperature of **20 – 23°C**.

2. pH

After the sample has been introduced into the digestion cuvette the pH must be 4.0. The pH can be checked visually.

Compare the colour of the prepared digestion cuvette with that of the reference cuvette (green) of the zero solution cuvette combination:

Colour if pH = 4.0: Digestion cuvette green

pH > 4.0: Digestion cuvette blue*

pH < 4.0: Digestion cuvette yellow*

* Check the pH of the sample (see under pH/temperature)

3. Thermostat

Heat thermostat to **100°C** (check temperature setting; higher temperatures result in dangerously high pressures). When this temperature has been reached, insert the cuvette combinations and start the reaction time (1h) again. **Insert the cuvette combinations into suitably sized thermostat shafts. Do not use reducing sleeves for large shafts.**

4. Disposal

Do not screw the cuvette combinations apart when the analysis has been completed, but press them back into the blister packs with the indicator cuvette upwards.

Safety Advice

On grounds of quality and reliability, the analysis should be carried out only with original HACH LANGE accessories.

NB!

Be sure to set the required temperature to 100°C (at 148°C the cuvette combinations may break apart).

CADAS 100 (≥ LPG 210)

If this test is not already stored in your instrument please ask your HACH LANGE Agency for programming instructions.

Applies to all types of photometer

Cyanide easily liberated

Edition 05/08

Please read carefully the information under the heading "Special note".

Waste water samples that have been treated with dithionite, sulphite or disulphite must be pretreated with the CleanUp-Set LCW 923.

1. Cyanide, easily liberated (see diagrams A – D)

Into the digestion cuvette pipette

Sample 2 mL

Close cuvette with original cap and invert a few times.

Check the pH by comparing the colour of the prepared digestion cuvette with that of the reference cuvette (green) of the zero solution cuvette combination.

Close indicator cuvette **very tightly** with membrane double cap (screw on the membrane double-cap in such a way that the barcode label is on the lower half of the cap). **Immediately** close the digestion cuvette **tightly** with the prepared indicator cuvette.

NB: Cuvettes must be held vertically and must not be inverted! The sample must not come into contact with the membrane of the double-cap!

2. Heating (see diagrams E + F)

Place the cuvette combination, with the coloured indicator cuvette upwards, in the **preheated** thermostat and heat for **exactly 1 h** at **100°C**. Then allow to cool to room temperature for **exactly 1 h** (indicator cuvette upwards).

3. Evaluation (see diagram G + H)

Clean the outside of the zero solution cuvette (blue) thoroughly, then insert in the photometer and measure. **Tighten** the sample cuvette combination again **before inverting** it. Clean the outside of the indicator cuvette thoroughly, insert in the photometer and measure. Press the used cuvette combinations back into the blister packs (**do not unscrew cuvette combinations!**).

Data table

LCK 319

| | |
|---|--------------|
| LP2W | 00/06 |
| Cyanide • $F_1 = 0$ • $F_2 = -0.499$ • $K = -0.016$ | |
| CADAS 30/30S/50/50S | 00/06 |
| Cyanide • λ : 575 nm • Pro.: 8 • $F_1 = 0.477$ • $F_2 = -0.478$ • $K = -0.022$ | |
| ISIS 6000/9000 | 00/06 |
| Cyanide • λ : 588 nm • Pro.: 8 • $F_1 = 0.496$ • $F_2 = -0.495$ • $K = -0.018$ | |
| CADAS 100 / \geq LPG 210 | 00/06 |
| Cyanide • λ : 575 nm • $F_1 = -0.478$ • $K = -0.021$ | |
| CADAS 200 Barcode / Basis | 00/06 |
| Cyanide • L1W1.(M.E1W1) • $C1 = (E1-L1)*F1-F2$ • W1 = 575 nm • $F1 = -0.478$ • $F2 = 0.02$ | |

Cyanide easily liberated

Edition 00/06

Evaluation

1. Press "Mode" key.
2. Insert program filter **590 nm**.
3. Select test with "Mode" key.
Control number must be **1*** (see below).
4. Insert zero solution cuvette (blue).
5. Insert indicator cuvette of the cuvette combination.

| Parameter | Display | Meas. range |
|---------------------------|---------------|------------------|
| Cyanide, easily liberated | CN LCK 319 1* | 0.03 – 0.35 mg/L |

Cyanide easily liberated

Edition 00/06

Evaluation

1. Press any key.
2. Check program control number: **__ : 44**
3. Select test with ↑ or ↓ key.
Control number must be **1*** (see below).
4. Insert zero solution cuvette (blue).
5. Insert indicator cuvette of the cuvette combination.

| Parameter | Display | Meas. range |
|---------------------------|---------------|------------------|
| Cyanide, easily liberated | CN LCK 319 1* | 0.03 – 0.35 mg/L |

Cyanide easily liberated

Edition 00/06

Evaluation

1. Insert filter **588 nm**.
2. Select »Dr. Lange« mode.
3. Select test number (see below).
4. Control number must be **2**.
5. Insert zero solution cuvette (blue) and press blue key.
6. Insert indicator cuvette of the cuvette combination and press green key.

| Parameter | Test-No. | Meas. range |
|---------------------------|----------|------------------|
| Cyanide, easily liberated | 319 | 0.03 – 0.35 mg/L |

Cyanide easily liberated

Edition 00/06

Evaluation

1. Insert program filter **588 nm**.
2. Press "Tests" key until display (see below) appears.
3. Control number must be **2**.
4. Insert zero solution cuvette (blue) and press "Null" (zero) key.
5. Insert indicator cuvette of the cuvette combination and press "Ergebnis" (result) key.

| Parameter | Display | Meas. range |
|---------------------------|---------|------------------|
| Cyanide, easily liberated | Test __ | 0.03 – 0.35 mg/L |

**Cyanide** easily liberated

Edition 00/06

Evaluation

1. Insert zero solution cuvette (blue).
2. Insert indicator cuvette of the cuvette combination.

| Parameter | Meas. range |
|---------------------------|------------------|
| Cyanide, easily liberated | 0.03 – 0.35 mg/L |

Cyanide easily liberated

Edition 00/06

Evaluation

1. Check program control number:
 __ : **44 (CADAS 200)**
 __ : **44 (ISIS 6000)** ⇒ Select »CUVETTE TEST« mode.
2. Select test number (see below).
3. Control number must be **2**.
4. Insert zero solution cuvette (blue) and press blue key.
5. Insert indicator cuvette of the cuvette combination and press green key.

| Parameter | Test-No. | Meas. range |
|---------------------------|----------|------------------|
| Cyanide, easily liberated | 319 | 0.03 – 0.35 mg/L |

Cyanide easily liberated

Edition 00/06

Evaluation

1. Select »TEST« mode.
2. Select symbol (see below).
3. Control number must be **2**.
4. Insert zero solution cuvette (blue) and press "NULL" (zero) key.
5. Insert indicator cuvette of the cuvette combination and press "MESS" (measure) key.

| Parameter | Symbol | Meas. range |
|---------------------------|--------|------------------|
| Cyanide, easily liberated | 319 | 0.03 – 0.35 mg/L |

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Edition 00/06

Evaluation

1. Select »Barcode Programs« .
2. Select test number (see below).
3. Control number must be **2**.
4. Insert zero solution cuvette (blue) and »Zero«.
5. Insert indicator cuvette of the cuvette combination and press »Read« .


| Parameter | Test-No. | Meas. range |
|---------------------------|----------|------------------|
| Cyanide, easily liberated | 319 | 0.03 – 0.35 mg/L |

Procedure
Cyanide, easily liberated

Cuvette Test
LCK 319

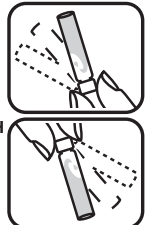
Waste water samples that have been treated with dithionite, sulphite or disulphite must be pretreated with the **CleanUp-Set LCW 923**.

Pipette 2 mL sample into the digestion cuvette.



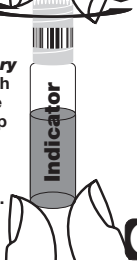
A

Close digestion cuvette with original cap and invert a few times. Check the pH by colour comparison. (see under Special note)



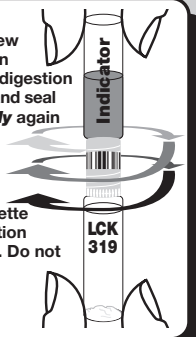
B

Close indicator cuvette **very tightly** with membrane double-cap (barcode label must be on lower half).



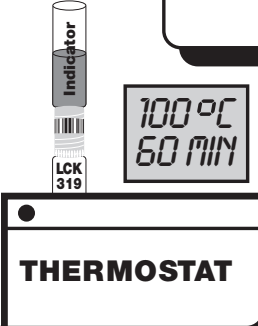
C

Screw open the digestion cuvette and seal it **securely** again with the prepared indicator cuvette. Hold cuvette combination vertically. Do not invert.



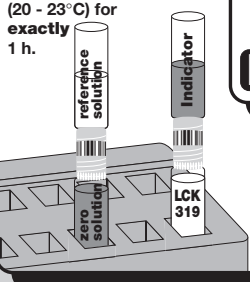
D

Heat cuvette combination in the **preheated** thermostat for **exactly** 1 h at 100°C.



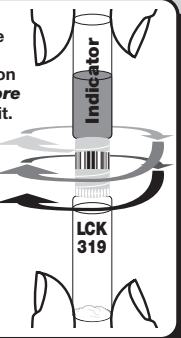
E

Allow cuvette combination to cool to room temperature (20 - 23°C) for **exactly** 1 h.



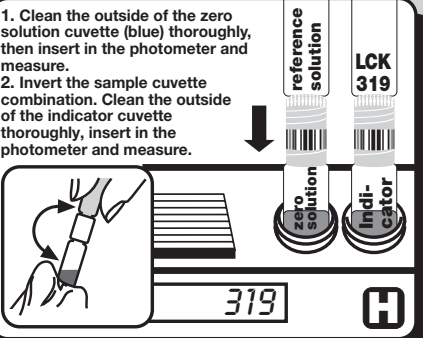
F

Tighten the sample cuvette combination **again before inverting** it.



G

1. Clean the outside of the zero solution cuvette (blue) thoroughly, then insert in the photometer and measure.
2. Invert the sample cuvette combination. Clean the outside of the indicator cuvette thoroughly, insert in the photometer and measure.



H