LCK 380 GB

TOC Total organic carbon

Principle
Total carbon (**TC**) and total inorganic carbon (**TIC**) are converted to carbon dioxide (CO_2) by, respectively, oxidation and acidification. The CO_2 passes from the digestion cuvette through a membrane and into the indicator cuvette. The change of colour of the indicator is photometrically evaluated. **TOC** (total organic carbon) is determined as the difference between the **TC** and **TIC** values.

Range of Application
Waste water, surface water, soils

Storage Information
The test reagents are stable at +15 to +25°C up to the expiry date given on the package.

Special note

1. *Contamination by ambient air*
   Never leave cuvette open, because carbon dioxide in the ambient air can cause high bias. Cuvettes must only be opened when necessary (e.g. to add sample) and must be closed or further processed ***immediately*** afterwards.
2. *How to use the powder dispenser*
   Screw powder dispenser on to digestion reagent A (LCK 380 A). Invert so that powder dispenser is under the reagent and shake. This causes the dispensing chamber to be filled. Position the centring recess of the powder dispenser above the **TC** cuvette and add ***one*** dose. Close digestion reagent A (LCK 380 A) immediately with original cap.
3. *Labelling the digestion cuvettes*
   If several samples are analysed simultaneously, label them so that the **TC** and **TIC** cuvette combinations of the same sample can be recognised.
4. *Thermostat*
   Heat the thermostat to ***100°C*** (check the temperature – higher temperatures lead to dangerous excess pressure). When this temperature has been reached, insert the cuvette combinations and start the reaction time (***2h***) again. Insert cuvette combinations only in the small shafts in the thermostat. Do not insert them in the large shaft with reducing sleeves.
5. *Disposal*
   Do ***not*** screw the cuvette combinations apart when the analysis has been completed, but press them back into the blister pack in combination with the indicator cuvette upwards.

Interferences
If the **TC** and/or the **TIC** results are higher than the upper limit of the measuring range, the calculated **TOC** result which is displayed may be within the measuring range.
In this case and generally the measurement results must be subjected to plausibility checks (dilute and/or spike the sample).
Use only carbon-free double-distilled water to dilute the sample.
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:

TIC-determination:

400 mg/L:	$HCOO^-$
250 mg/L:	CH_3COO^-
30 mg/L:	SO_3^{2-}
10 mg/L:	S^{2-}
3 mg/L:	NO_2-N

Higher concentrations of these ions cause high-bias results.

TC-determination:

500 mg/L:	Cl^-
200 mg/L:	Ca^{2+}, Mg^{2+}
100 mg/L:	NH_4-N

Higher concentrations of these ions cause low-bias results.

pH/Temperature
The pH of the sample must be between pH 4 and pH 10. The temperature of the sample and reagents must be between 15 and 25°C.

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 100ºC (at 148ºC the cuvette combinations may break apart).

The digestion conditions are such that oxygen is formed, and this causes a rise in pressure in the cuvette combinations. If the cuvette combinations are subjected to strong mechanical stress after the digestion reaction, e.g. if they suffer a blow or a fall, they may shatter. In this case glass splinters may cause injury.

CADAS 100 (LPG 185 / ≥ 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

TOC Total organic carbon

Edition 96/03

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

Carry out each TC determination in sequence in order to avoid contamination by ambient air (diagram A – E).

1. TC determination (see diagram A - E)

Into the **TC cuvette** dispense and pipette:

Digestion reagent A (LCK 380 A)	1 dose of powder
Sample	2 mL

Close **TC cuvette** with original cap and invert a few times. Close the indicator cuvette ***very tightly*** with the 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*** screw the prepared indicator cuvette ***tightly*** on to the **TC 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!

Procedure LCK 380

Applies to all types of photometer

TOC Total organic carbon

Edition 96/03

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

Carry out each TIC determination in sequence in order to avoid contamination by ambient air (diagram F – I).

2. TIC determination (see diagram F - I)

Into the **TIC cuvette** pipette:

Sample	2 mL

Close **TIC cuvette** with original cap and invert a few times. Close the indicator cuvette ***very tightly*** with the 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*** screw the prepared indicator cuvette ***tightly*** on to the **TIC 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!

3. Heat (see diagram J + K)

Place the cuvette combinations in the ***preheated*** thermostat with the coloured indicator cuvette upwards, and heat for ***2 h*** at ***100°C***. For **TOC** determination the **TC** and **TIC** cuvette combinations must be heated simultaneously in the thermostat. Allow to cool to room temperature (indicator cuvette upwards).

4. Evaluation (see diagram L + M)

First clean the outside of the indicator cuvette of **TC** cuvette combination thoroughly ***(NB: when you clean the cuvette, be careful not to turn it in such a way that the cuvette combination could accidentally be screwed apart)***. Place in photometer and measure – **1. Measurement**. Then clean the outside of the indicator cuvette of **TIC** cuvette combination thoroughly ***(NB: when you clean the cuvette, be careful not to turn it in such a way that the cuvette combination could accidentally be screwed apart)***. Place in photometer and measure – **2. Measurement**. Press the used cuvette combinations back into the blister pack ***(do not unscrew cuvette combinations!)***.

LP2W	***98/04***
TC • $F_1 = 0$ • $F_2 = 110$ • $K = -21.08$	
TIC • $F_1 = 0$ • $F_2 = 126.4$ • $K = -19.98$	
CADAS 30/50	***98/04***
TC/TIC • λ: 435 nm • Pro.: 11 • $F_1 = 108$ • $F_2 = 0$ • $F_3 = 122.5$ • $F_4 = 0$ • $K_1 = -24.52$ • $K_2 = -23.22$	
CADAS 30S/50S	***98/04***
TC/TIC • λ: 435 nm • Pro.: 11 • $F_1 = 108.1$ • $F_2 = 0$ • $F_3 = 122.7$ • $F_4 = 0$ • $K_1 = -24.52$ • $K_2 = -23.22$	
ISIS 6000/9000	***98/04***
TC/TIC • λ: 430 nm • Pro.: 11 • $F_1 = 109.5$ • $F_2 = 0$ • $F_3 = 125.7$ • $F_4 = 0$ • $K_1 = -26.13$ • $K_2 = -24.89$	
CADAS 100 / LPG 185	***98/04***
TOC/TC/TIC • λ: 435 nm • $F_1 = 106.6$ • $F_2 = -20.69$ • $F_3 = 122.2$ • $F_4 = -18.53$ • $F_5 = 1$ • $F_6 = -1$	
CADAS 100 / ≥ LPG 210	***98/04***
TOC/TC/TIC • λ: 435 nm • $F_1 = 106.6$ • $F_2 = -20.69$ • $F_3 = 122.2$ • $F_4 = -18.53$	

TOC Total organic carbon

Edition 98/04

Evaluation

1. Press "Mode" key and check program control number:
   __ : 40
2. Insert program filter **440 nm**.
3. Select test with "Mode" key.
4. Insert indicator cuvette of the **TC** cuvette combination.
5. Insert indicator cuvette of the **TIC** cuvette combination.
   20 sec display = **TC**
   20 sec display = **TIC**
   20 sec display = **TOC**
   or by pressing the key ✻ the results for **TC**, **TIC** *and* **TOC** *can be called up immediately one after another.*

Parameter	Display	Meas. range
TOC	TOC LCK 380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

LASA 10 / 20 LCK 380

TOC Total organic carbon

Edition 98/04

Evaluation

1. Press any key.
2. Check program control number: **__ : 40**
3. Select test with ↑ or ↓ key.
4. Insert indicator cuvette of the **TC** cuvette combination.
5. Insert indicator cuvette of the **TIC** cuvette combination.
   20 sec display = **TC**
   20 sec display = **TIC**
   20 sec display = **TOC**
   or by pressing the key ↓ the results for **TC**, **TIC** *and* **TOC** *can be called up immediately one after another.*

Parameter	Display	Meas. range
TOC	TOC LCK 380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

LASA 30 LCK 380

TOC Total organic carbon

Edition 98/04

Evaluation

1. Insert filter **440 nm**.
2. Select »Dr. Lange« mode.
3. Select test number (see below).
4. Control number must be **2**.
5. Insert indicator cuvette of the **TC** cuvette combination and press green key.
6. Insert indicator cuvette of the **TIC** cuvette combination and press green key.

The result is displayed in **TC**, **TIC** *and* **TOC**.

Parameter	Test-No.	Meas. range
TOC	380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

LP2W LCK 380

TOC Total organic carbon

Edition 98/04

Evaluation

TC determination

1. Insert program filter **435 nm**.
2. Press ”Tests“ key until display (see below) appears.
3. Control number must be **4**.
4. Insert blank-value cuvette (distilled water) and press ”Null“ (zero) key.
5. Insert indicator cuvette of the **TC** cuvette combination and press ”Ergebnis“ (result) key.
   Make a note of the display **– TC**

TIC determination

1. Insert program filter **435 nm**.
2. Press ”Tests“ key until display (see below) appears.
3. Control number must be **4**.
4. Insert blank-value cuvette (distilled water) and press ”Null“ (zero) key.
5. Insert indicator cuvette of the **TIC** cuvette combination and press ”Ergebnis“ (result) key.
   Make a note of the display **– TIC**

Calculation of the TOC concentration:
TC - TIC = mg/L TOC

Parameter	Display	Meas. range
TOC		2 – 65 mg/L
TC	TC LCK 380	12 – 75 mg/L
TIC	TIC LCK 380	10 – 73 mg/L

Photometer with Barcode-System LCK 380

TOC Total organic carbon

Edition 98/04

Evaluation

1. Check program control number:
   __ : 40 (CADAS 30S/50S/200, ISIS 9000)
2. Insert indicator cuvette of the **TC** cuvette combination.
3. Insert indicator cuvette of the **TIC** cuvette combination.

CADAS 30/50, ISIS 9000:
The results for **TC**, **TIC** *and* **TOC** *can be called up by pressing the key under the symbol* → .

CADAS 30S/50S/200, LASA 50/100, XION 500:
The result is displayed in **TC**, **TIC** *and* **TOC**.

Parameter	Meas. range
TOC	2 – 65 mg/L
TC	12 – 75 mg/L
TIC	10 – 73 mg/L

CADAS 200Basis, ISIS 6000 **LCK 380**

TOC Total organic carbon

Edition 98/04

Evaluation

1. Check program control number:
   __ : 40 (CADAS 200)
   __ : 40 (ISIS 6000) ⇒ Select »CUVETTE TEST« mode.
2. Select test number (see below).
3. Control number must be **2**.
4. Insert indicator cuvette of the **TC** cuvette combination and press green key.
5. Insert indicator cuvette of the **TIC** cuvette combination and press green key.

ISIS 6000:
The results for **TC**, **TIC** *and* **TOC** *can be called up by pressing the key under the symbol* → .

CADAS 200:
The result is displayed in **TC**, **TIC** *and* **TOC**.

Parameter	Test-No.	Meas. range
TOC	380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

CADAS 100 (LPG 185) **LCK 380**

TOC Total organic carbon

Edition 98/04

Evaluation

1. Select »TEST« mode.
2. Select symbol (see below).
3. Select symbol » > «.
4. Check factors and measuring wavelength in memory »Mem«.
5. Insert blank-value cuvette (distilled water) and press "NULL" (zero) key.
6. Insert indicator cuvette of the **TC** cuvette combination and press "MESS" (measure) key.
7. Insert blank-value cuvette (distilled water) and press "NULL" (zero) key.
8. Insert indicator cuvette of the **TIC** cuvette combination and press "MESS" (measure) key.

The result is printed out in **TC**, **TIC** *and* **TOC**.

If more than one sample is to be measured start the next evaluation at point 5.

Parameter	Symbol	Meas. range
TOC	$ 380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

CADAS 100 (≥ LPG 210) **LCK 380**

TOC Total organic carbon

Edition 98/04

Evaluation

1. Select »TEST« mode.
2. Select symbol (see below).
3. Control number must be **2**.
4. Insert blank-value cuvette (distilled water) and press "NULL" (zero) key.
5. Insert indicator cuvette of the **TC** cuvette combination and press "MESS" (measure) key.
6. Insert indicator cuvette of the **TIC** cuvette combination and press "MESS" (measure) key.

The result is printed out in **TC**, **TIC** *and* **TOC**.

If more than one sample is to be measured start the next evaluation at point 5.

Parameter	Symbol	Meas. range
TOC	380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

DR 1900 **LCK 380**

TOC Total organic carbon

Edition 98/04

Evaluation

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

The result is displayed in **TC**, **TIC** *and* **TOC**.

Parameter	Test-No.	Meas. range
TOC	380	2 – 65 mg/L
TC		12 – 75 mg/L
TIC		10 – 73 mg/L

HACH LANGE
UNITED FOR WATER QUALITY

Procedure
Applies to all types of photometer

Cuvette Test LCK 380