

**COD LR TT****M130****3 - 150 mg/L COD<sup>b)</sup>****Lr****Dichromate / H<sub>2</sub>SO<sub>4</sub>**

## Instrument specific information

The test can be performed on the following devices. In addition, the required cuvette and the absorption range of the photometer are indicated.

Instrument Type	Cuvette	$\lambda$	Measuring Range
MD 100, MD 110, MD 200, MD 600, MD 610, MD 640, MultiDirect	ø 16 mm	430 nm	3 - 150 mg/L COD <sup>b)</sup>
XD 7000, XD 7500	ø 16 mm	443 nm	3 - 150 mg/L COD <sup>b)</sup>

## Material

Required material (partly optional):

Reagents	Packaging Unit	Part Number
COD LR/25	25 pc.	2420720
COD LR/25, mercury free	25 pc.	2420710
COD LR/150	150 pc.	2420725

The following accessories are required.

Accessories	Packaging Unit	Part Number
Thermoreactor RD 125	1 pc.	2418940

## Application List

- Raw Water Treatment
- Waste Water Treatment

## Notes

1. The blank is stable when stored in the dark.
2. Blanks and test vials must be from the same batch.
3. Do not place hot vials in the sample chamber. The most stable measured values can be determined if the vials are left standing overnight.





## Removal of high Chloride concentration in COD samples

Chloride content may interfere during COD determination, if the tolerance level of the used test will be exceeded. To overcome that problem the following sample pretreatment can be used:

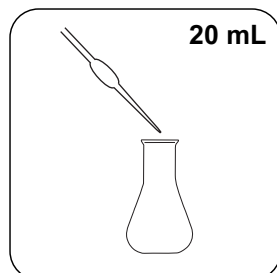
### Equipment:

- 2 Erlenmeyer flasks 300 mL with NS 29/32 connection
- 2 HCl absorber according to DIN 38409
- 2 glass stoppers NS 29/32
- Pipettes for volumes of 20 and 25ml
- Magnetic stirrer and magnetic stirring rods
- Thermometer to measure 0 - 100 °C
- Ice bath

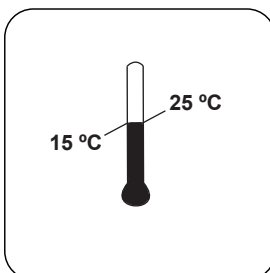
### Reagents:

- 12 to 14 g of sodalime
- 50 mL  $\text{H}_2\text{SO}_4$  (95 - 97%, 1.84 g/ml, CSB free)
- Hydrochloric acid 10 % to clean absorber from residual lime

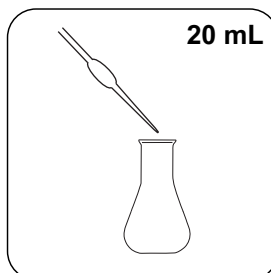
**The work must be carried out under a fume hood!**



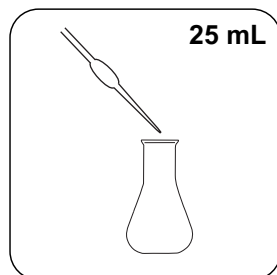
Put **20 mL homogenised sample** in the erlenmeyer flask.



Add the magnetic stirring rod, and cool in the ice bath.



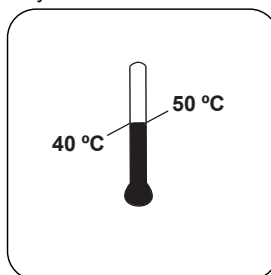
Put **20 mL deionized water** in the second erlenmeyer flask.



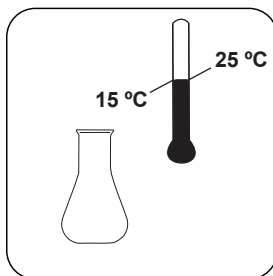
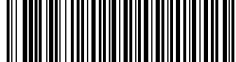
Add slowly **25 mL concentrated Sulfuric acid** each under cooling and stirring.



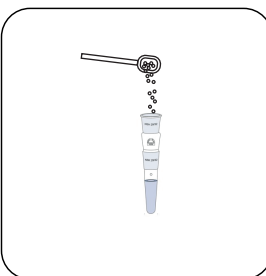
**Sample will be hot!**



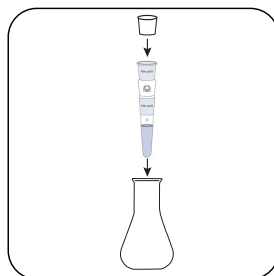
Temperature should not exceed 40 to 50 °C.



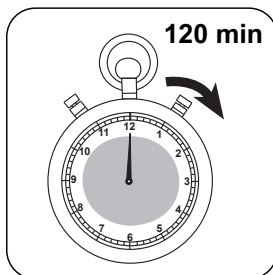
After the complete addition of the sulfuric acid, cool to room temperature in the ice bath.



Add **6 - 7 g soda lime powder** into the absorption tubes.



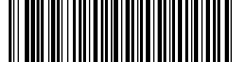
Close the absorption tubes with a plug and fit onto the Erlenmeyer flasks.



Stir at about 250 rpm for **120 minutes** at room temperature (a turbidity may be formed).

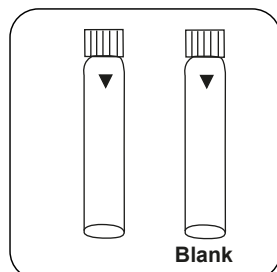
This sample is used for the analysis of COD. Due to this pretreatment procedure the original sample has been diluted by a factor of 2.05.

$$CSB_{\text{sample}} = CSB_{\text{display}} \times 2.05$$

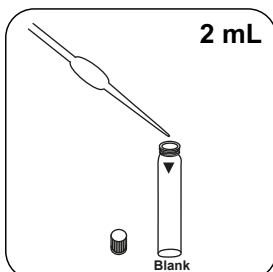


## Determination of COD LR with Vario Vial Test

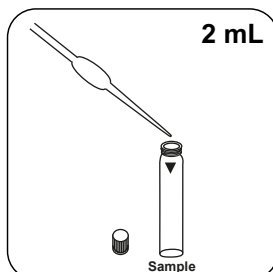
Select the method on the device.



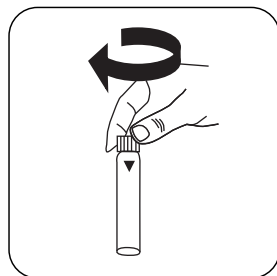
Prepare two **reaction vials**.  
Mark one as a blank.



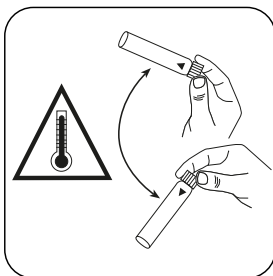
Put **2 mL deionised water**  
in the blank.



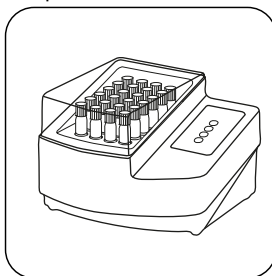
Put **2 mL sample** in the  
sample vial.



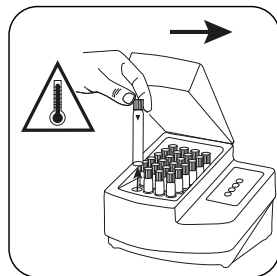
Close vial(s).



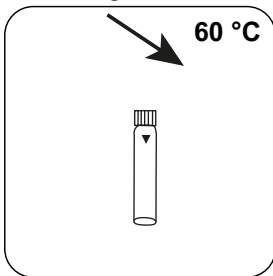
Carefully invert several  
times to mix the contents.  
**Note: Will get hot!**



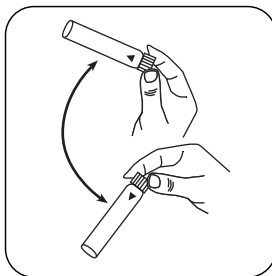
Seal the vials in the pre-  
heated thermoreactor for  
**120 minutes at 150 °C**.



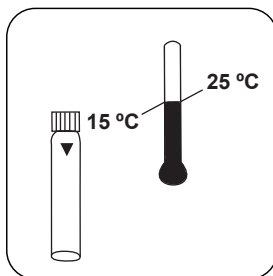
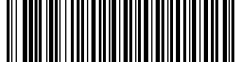
Remove the vial from the  
thermoreactor. (**Note: vial  
will be hot!**)



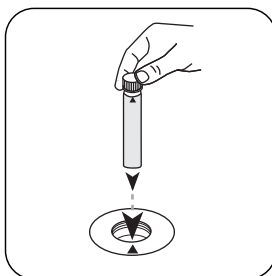
Allow vial(s) to cool to 60  
°C.



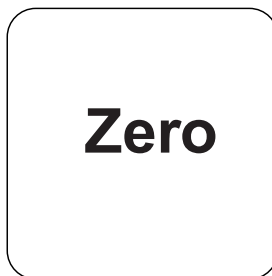
Invert several times to mix  
the contents.



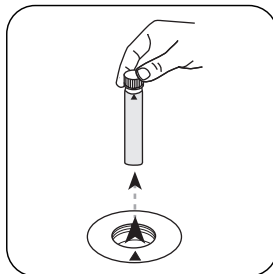
Allow the vial to cool to room temperature and then measure.



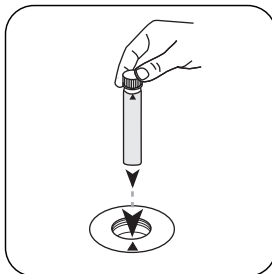
Place **blank** in the sample chamber. • Pay attention to the positioning.



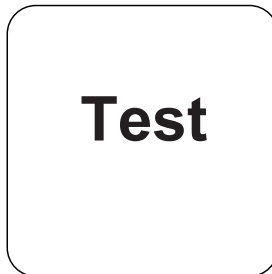
Press the **ZERO** button.



Remove **vial** from the sample chamber.



Place **sample vial** in the sample chamber. • Pay attention to the positioning.



Press the **TEST** (XD: **START**) button.

The result in mg/L COD appears on the display.



## Chemical Method

Dichromate / H<sub>2</sub>SO<sub>4</sub>

## Appendix

### Calibration function for 3rd-party photometers

$$\text{Conc.} = a + b \cdot \text{Abs} + c \cdot \text{Abs}^2 + d \cdot \text{Abs}^3 + e \cdot \text{Abs}^4 + f \cdot \text{Abs}^5$$

	ø 16 mm
a	$2.16352 \cdot 10^{-2}$
b	$-2.71531 \cdot 10^{-2}$
c	
d	
e	
f	

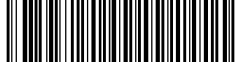
## Interferences

### Persistent Interferences

- In exceptional cases, contents, for which the oxidation capacity of the reagent is not sufficient, can lead to lower results.

### Removeable Interferences

- Suspended solids in the vial can lead to incorrect measurements and so to avoid this, it is important to place the vials carefully in the sample chamber as the method necessitates a build-up of precipitate at the bottom of the vial.
- The outer walls of the vial must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the vial lead to incorrect measurements.
- In the standard version, chloride interferes from a concentration of 1000 mg/L. In the mercury-free version, the disturbance depends on the chloride concentration and the COD. Concentrations from 100 mg/L chloride can lead to significant disturbances here.



## Method Validation

<b>Limit of Detection</b>	3.2 mg/L
<b>Limit of Quantification</b>	9.7 mg/L
<b>End of Measuring Range</b>	150 mg/L
<b>Sensitivity</b>	-272 mg/L / Abs
<b>Confidence Intervall</b>	3.74 mg/L
<b>Standard Deviation</b>	1.55 mg/L
<b>Variation Coefficient</b>	2.02 %

### Conformity

ISO 15705:2002

### According to

ISO 15705:2002

DIN 38409 part 41

<sup>9)</sup> Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, - phosphate, -nitrogen, (100 °C)