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.

<table>
<thead>
<tr>
<th>Instrument Type</th>
<th>Cuvette</th>
<th>λ</th>
<th>Measuring Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD 100, MD 110, MD 200, MD 600, MD 610, MD 640, MultiDirect</td>
<td>ø 16 mm</td>
<td>610 nm</td>
<td>20 - 1500 mg/l COD&lt;sup&gt;b)&lt;/sup&gt;</td>
</tr>
<tr>
<td>SpectroDirect, XD 7000, XD 7500</td>
<td>ø 16 mm</td>
<td>596 nm</td>
<td>20 - 1500 mg/l COD&lt;sup&gt;b)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Material

Required material (partly optional):

<table>
<thead>
<tr>
<th>Reagents</th>
<th>Packaging Unit</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD MR/25</td>
<td>25 pc.</td>
<td>2420721</td>
</tr>
<tr>
<td>COD MR/25, mercury free</td>
<td>25 pc.</td>
<td>2420711</td>
</tr>
<tr>
<td>COD MR/150</td>
<td>150 pc.</td>
<td>2420726</td>
</tr>
<tr>
<td>COD MR/150, mercury free</td>
<td>150 pc.</td>
<td>2420716</td>
</tr>
</tbody>
</table>

The following accessories are required.

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Packaging Unit</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoreactor RD 125</td>
<td>1 pc.</td>
<td>2418940</td>
</tr>
</tbody>
</table>

Application List

- Raw Water Treatment
- Waste Water Treatment
Notes

1. The blank is stable when stored in the dark. Blanks and test vials must be from the same batch.
2. Do not place hot vials in the sample chamber. The most stable measured values can be determined if the vials are left standing overnight.
3. For samples under 100 mg/l COD it is recommended to use the tube test COD LR if a higher degree of accuracy is required.
Implementation of the provision COD MR 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$_2$SO$_4$

Appendix

Calibration function for 3rd-party photometers
Conc. = $a + b \cdot \text{Abs} + c \cdot \text{Abs}^2 + d \cdot \text{Abs}^3 + e \cdot \text{Abs}^4 + f \cdot \text{Abs}^5$

<table>
<thead>
<tr>
<th>$\phi$ 16 mm</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$a$</td>
<td>$-1.04251 \times 10^{-1}$</td>
</tr>
<tr>
<td>$b$</td>
<td>$2.09975 \times 10^{-3}$</td>
</tr>
<tr>
<td>$c$</td>
<td></td>
</tr>
<tr>
<td>$d$</td>
<td></td>
</tr>
<tr>
<td>$e$</td>
<td></td>
</tr>
<tr>
<td>$f$</td>
<td></td>
</tr>
</tbody>
</table>

Interferences

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

Removable 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.

<table>
<thead>
<tr>
<th>Interference</th>
<th>from / [mg/l]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl$^-$</td>
<td>1000</td>
</tr>
</tbody>
</table>
Method Validation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit of Detection</td>
<td>8.66 mg/l</td>
</tr>
<tr>
<td>Limit of Quantification</td>
<td>25.98 mg/l</td>
</tr>
<tr>
<td>End of Measuring Range</td>
<td>1.5 mg/l</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>2,141 mg/l / Abs</td>
</tr>
<tr>
<td>Confidence Intervall</td>
<td>18.82 mg/l</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>7.78 mg/l</td>
</tr>
<tr>
<td>Variation Coefficient</td>
<td>1.04 %</td>
</tr>
</tbody>
</table>

Conformity
ISO 15705:2002

According to
ISO 15705:2002
DIN 38409 part 43

\[\text{Reactor is necessary for COD (150 °C), TOC (120 °C) and total -chromium, -phosphate, -nitrogen, (100 °C)}\]