Contents

Important: The sampling station DCM01 is a measuring system made up of several components. The technical documentation for TOPAX NT (BW 4 61 10) and the total chlorine measuring cell GCM (MB 4 12 10) must therefore also be noted.

1. General

The sampling station DCM 01 is used in swimming pools, water works and many industrial water treatment plants to determine the water parameters free chlorine, combined chlorine, total chlorine, pH value and Redox potential.
An electronic controller of type TOPAX NT can be mounted directly on the wall panel to provide a compact measurement and control unit for controlling such correcting elements as the control valve or metering pump.
The routing of the sample water is of decisive importance for obtaining perfect results. It is therefore advisable to read through the instructions on hydraulic installation before installing the system (refer also to MB 4 37 30).

2. Scope of delivery

Depending on the equipment configuration with which the sampling station was ordered, installation material is supplied with the panel in varying degrees. The delivered goods should therefore be compared with those specified on the delivery note as soon as the parts have been unpacked.

3. Functions

All the following functional units of the sampling stations are accommodated in a transparent multi-functional equipment block.

- *Potentiostatic chlorine measuring cell*
  with electrode cleaning function
  without zero calibration
- *pH and Redox measurement*
  with combination electrode
- *Temperature sensor Pt 100*
- *Diaphragm-covered total chlorine measuring cell GCM*
  installed in the PMMA flow meter
- *Hydrostatic flow control*
  with gas-bubble separator
  for a uniform flow through the measuring cell
- *Sample water filter*
  to protect the measuring cell against coarse dirt
- *Precision control valve*
  for adjusting the water flow
- *Flow monitor*
  deactivates the control system if there is a shortage of sample water.
- *Equipotential bonding pin*
  to dissipate interfering external potentials
- *Sampling*
  for manual sampling of the water during calibration

A detailed description of the various functions can be found in data sheet MB 4 37 30.

4. Installation

The sampling station is mounted on the wall so that the electronic controller can easily be read and operated by the operating personnel. For fixing use the screws and washers supplied. Their material and dimensions are specially adapted to this application.

4.1 Hydraulic connection

The sample water is delivered to the sampling station through plastic pipes or hoses made of PVC or PE. Metal pipes must not be used under any circumstances, as they could affect the result due to chlorine consumption.
The sample water must be routed to the sampling station with the least possible **delay** in order to ensure effective control of the water quality. The sample water line should therefore be as short as possible and with small cross-sections. A line with a length of 25 metres and nominal diameter DN6 is sufficient to cause a delay of approx. 1 minute. This delay is increased to approx. 5 minutes if a size DN15 line is used in order to avoid high pressure losses.
The applicable regulations must be observed when **withdrawing the sample water**. DIN 19643, for example, prescribes that the water in swimming pools must be withdrawn directly from the pool in order to eliminate measurement errors due to chlorine consumption in the overflow. If the sample water is drawn from a pipeline, it must be sampled from the middle of the pipe as illustrated in the diagram below.
Installation of an **80 µm prefilter** is often useful, particularly in outdoor swimming pools in which the sample water is drawn directly from the pool. Without such a prefilter, blossoms and leaves in the pool water, for example, could clog the dirt trap

in the acrylic block (refer to the installation drawings in MB 2 37 30). The inserts of the dirt trap and 80 µm filter must be cleaned at regular intervals and replaced so that the measured value is not affected by chlorine consumption in these filters.
Use of a sample water pump is advisable when the sample water is not supplied with sufficient pressure (at least 0.2 bar at the connection to the sampling station). This also helps to avoid long delays when covering large distances between withdrawal point and sampling station.
The pump delivers the sample water over the long distance in a loop line past the sampling station and only a partial flow is used for the actual measurement. The throttle valve must never be closed completely otherwise very long delays will make control more difficult. Moreover, the water in the pump would heat up strongly and result in measuring errors. A pressure gauge in the loop line is useful for adjusting the throttle valve.
The **water drain** at the sampling station is pressureless. The water has to be able to drain freely under the force of gravity. A pump has to be installed if the test water is to be returned to a pressurized system. An immersion pump in a collecting vessel for the sample water is useful here (refer to the installation drawings in MB 2 37 30).

4.2 Electrical connection

Regarding the general electrical installation local regulations (DIN, VDE, ...) must be observed. Electrical work must always be carried out by specialist staff.
The controller or measuring amplifier should be mounted directly on the sampling station or as close as possible to the sampling station if mounted to an electric switchboard. Particularly connecting lines from pH and Redox sensors to the amplifier must not exceed 15 metres in length without additional precautions being taken. With larger distances an impedance converter has to be installed at the electrode. Measuring lines must never be run directly in parallel to mains or control lines and their installation channels; any crossings must be made at right angles (90°).
A potential compensation is necessary if disturbance voltages cause measuring errors, particularly during chlorine and pH measurement.
The combined pH and Redox probes are connected to the measuring amplifier via BNC connectors. The chlorine measuring cells are connected to the potentiostate electronic components via series terminal strips. Note also the operating instructions for the controller and measuring cells.

5. Startup

5.1 Sensor mounting

During transport a plastic rod is fixed instead of the reference electrode to prevent the glass balls falling out of the measuring cell. Remove this rod together with the reinforced PG screw coupling and screw in the reference electrode again. The enclosed O-ring is slipped approx. 30 mm over the reference electrode.
Note:
Make sure that sample water does not flow when installing the reference electrode, otherwise the glass balls may dragged along from the chlorine measuring cell.

The combination pH and Redox probes are inserted in the acrylic block from above with the enclosed PG13.5 reinforced screw couplings. The temperature sensor is inserted laterally from the bottom with the PG7 screw coupling.
After being filled with electrolyte the total chlorine measuring cell is inserted in the housing (see MB 4 12 10).
Note:
Keep the protecting caps of the glass electrodes and total chlorine measuring cell in a safe place. They will be needed again to keep the electrodes moist and to protect them if the sampling station is put out of service.

5.2 Switching on the sample water

The needle valve on the acrylic block is set so that water flows off through the overflow pipe. If fluctuations in the system pressure are to be expected (for instance when the pumps are switched off overnight), the needle valve must be set to the lowest system pressure to ensure an adequate flow through the measuring cell at all times. When there is a sufficient flow of sample water, the glass balls in the chlorine measuring cell begin to rotate, the floated element rises and the Reed contact closes. Thus a sufficient flow of sample water is indicated to the electronic controller.

5.3 Calibration of the measuring amplifiers

Sample water should flow for approx. 1 hour before calibrating the measuring amplifiers, since the chlorine measuring cells in particular require a certain break-in period before delivering stable measuring values. The measuring amplifiers are calibrated in the same way regardless which model. The procedure is described in detail in the operating instructions for the measuring amplifiers and controller.
Note the sequence: temperature, pH and Redox are calibrated first, then the potentiostate and finally the total chlorine measuring cell.

Two buffer solutions are required to calibrate the pH value. These solutions should represent the limits of the expected measuring range (e.g. buffer solutions with pH 6.8 and pH 9.28 for measuring values around pH 7.2).
Note:
The buffer solutions only have a shelf life of approx. 6 weeks once opened. Calibration is carried out under flowing sample water. The pH reference and metering electrode can be fitted in the holder at the front of the acrylic block during calibration.

Redox potential
Only one buffer solution (e.g. 468 mV) is required for calibration of the Redox measuring amplifier. This buffer solution also has a shelf life of only approx. 6 weeks once opened.
Calibration is carried out under flowing sample water. The Redox electrode can be fitted in the holder at the front of the acrylic block during calibration.
Residual chlorine measuring cell
Since measurement of the free effective chlorine strongly depends on pH, the chlorine measuring amplifier must not be adjusted until pH calibration is completed and stable pH values are obtained.
Zero calibration is not required for the measuring cell based on the potentiostatic principle. It is only necessary if either the zero point of the measuring amplifier is maladjusted or the measuring amplifier definitely requires zero calibration.
The “zero condition” of the measuring cell is obtained by disconnecting the cable to the gold electrode. The cable is reconnected after adjusting the zero point. A very high reading appears at first. The slope can only be calibrated when this high reading has gradually dropped to a stable value.
To **calibrate the slope**, a water sample is taken from the swivelling overflow and the concentration of free effective chlorine determined manually. A photometer based on the DPD method is usually used for this purpose. The operating instructions of the measuring instrument must be followed precisely and great care taken to ensure cleanliness. Soiled cuvettes and fingerprints on the cuvette can cause major measuring faults. The manually determined value is **immediately set on the chlorine measuring amplifier**.
When starting-up the system for the first time, the chlorine measuring amplifier must be recalibrated after one or two days. During this time, the surface of the electrodes adapts itself to the mechanical and chemical operating conditions.
Total chlorine measuring cell
Refer to technical documentation MB 4 12 10/2

The **temperature sensor PT 100** can be calibrated in accordance with a comparison measurement (e.g. with a swimming pool thermometer).

6. Operation
During operation of the sampling station, watch that a little water constantly flows through the overflow. If necessary, the needle valve must be opened a little further.
Calibration of the measuring amplifiers should be checked every week unless local regulations specify a shorter interval. If necessary, readjust the measuring amplifiers (see above).
The filters in the sample water feed-line should be checked at the same intervals. If they are clogged, they must be cleaned or replaced in order to prevent distortion of the measured values due to chlorine depletion in the filters.

7. Switching off
The flow of water through the measuring cell should not be switched off if operation is only to be interrupted for a short time. Without a flow of water, deposits would build up on the surface of the electrodes and would first have to be removed by the rotating balls when the system is restarted. An additional break-in period would consequently have to be expected for the chlorine measuring cell. If the system is switched off for several days or, e.g. for the winter, the water should be discharged from the fittings block and the chlorine measuring cell dried completely.
IMPORTANT !
Make sure that the glass balls do not get lost when the electrodes are removed.

The pH, Redox and reference electrodes must be protected from drying out. The enclosed rubber cap must be filled with KCl solution and attached to the electrode bottom. The electrodes are stored in an upright position with the electrode bottom pointing downwards.

8. Maintenance
Annual maintenance is limited to visual inspection of all components and, if necessary, cleaning the fittings block with replacement of the seals.
The **service life of the glass electrodes** depends on the operating conditions and properties of the water (e.g. aggressiveness, grease, etc.). It is normally approx. 12-15 months including 50% storage time. Ensure that the O-ring is fitted on the glass shaft when remounting the reference electrode.

The **gold and stainless steel electrodes** can have a service life of up to several years, depending on the aggressiveness and abrasiveness of the water. They need only be replaced if they display major signs of wear (e.g. very thin patches on the gold wire). Extensive fouling on the surface of the metal can be carefully removed with fine abrasive linen (e.g. grain size 800).

IMPORTANT!
Make sure that the glass balls do not get lost when the electrodes are removed.

The **nozzle** from which water flows into the residual chlorine measuring cell can be pulled out to the side for cleaning with M5 threaded rod and subsequently refitted.
The upper **stop for the float** must be re-adjusted after dismounting the complete block. The adjustment is carried out as shown in the following drawing. The electrical flow of the Reed contact is tested in order to check the switching function (float at top: contact closed, float at bottom: contact open). If the switching function still is not perfect after adjusting the upper stop, the Reed contact can be shifted in the clamped joint in order to obtain precise adjustment.

9. Troubleshooting

Type of fault	Possible cause	Recommended action
Balls in the chlorine measuring cell rotate too slowly or float does not rise.	Water pressure too low.	Use a sample water line with a larger cross-section. IMPORTANT! Note the delay.
		Installation of a sample water pump (see 4.1 Hydraulic connection).
	Filter in the sample water line or fitting block fouled.	Clean or replace the filter insert.
	Needle valve clogged.	Fully open the needle valve once and re-adjust.
	Inflow nozzle of chlorine measuring cell severely fouled.	Clean nozzle (see 8. Maintenance).
	Probe of chlorine measuring cell is not centered in its bore.	Fit O-ring on reference electrode (see 5.1 Sensor installation).
Float rises, but Reed contact does not close.	Mismatch between float and Reed contact.	Adjust upper stop for float (see 8. Maintenance). Adjust Reed contact in clamped joint if necessary.
	Reed contact defective.	Replace Reed contact.
Reading on connected measuring amplifier fluctuates irregularly and does not correspond to the comparison measurement.	Slight leakage flows in the pumps, cause interfering voltages in the sample water.	Connect equipotential bonding pin, e.g. to protective conductor of measuring amplifier.
	Connected devices are not electrically isolated.	Connect a potential separator at the current outputs 0(4)...20mA of the measuring amplifier.
	Particularly when measuring the residual chlorine: Unstedy pH value has a disproportionately strong effect on chlorine measurement. (With manual measurements using the DPD method, non-active chlorine in the water is also determined as a result of pH-reduction thus simulating a higher chlorine concentration).	Stabilize the pH value of the water (e.g. optimize the open loop, controller parameters). Switch on pH compensation.
Reading on the measuring amplifier for free chlorine is identical with the comparison measurement on the sampling station, but differs from the comparison measurement directly in the pool.	Chlorine depletion in the sample water line resulting from severely fouled filters or metal pipes.	Clean or replace filter inserts, use plastic pipes or tubing lines instead of metal pipes.
	Long delay resulting from long sample water line with relatively large cross-section. The water at the sampling station corresponds to that in the pool some time ago.	Reduce the delay, e.g. by using a sample water pump (see 4.1 Hydraulic connection).
Reading on measuring amplifier for total chlorine cannot be calibrated correctly. Physical measuring value too low.	Electrolyte or diaphragm of total chlorine measuring cell is foul / aged.	First replace electrolyte; if this proves unsuccessful, replace the diaphragm cap and electrolyte.
	Deposit on front end of electrode finger.	Remove with fine emery (grain size 800). See MB 4 12 10