Chlorine Sampling Station DCM01

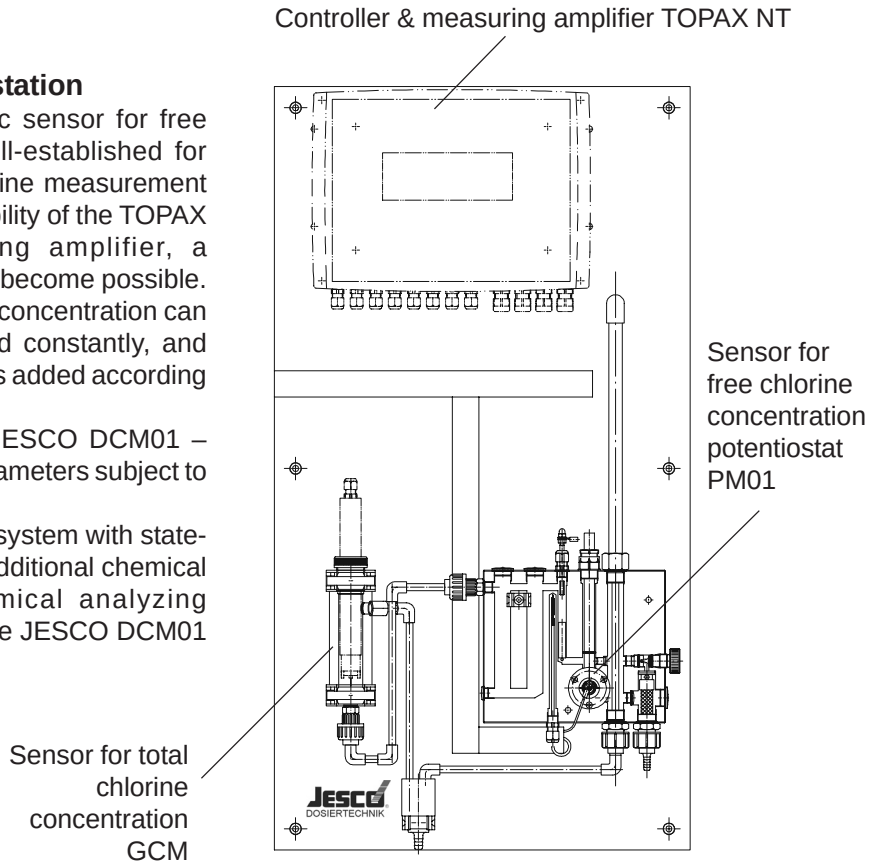
General

For swimming pool water chlorine in different types of use is the predominant disinfectant. JESCO has been offering the technology for continuous measurement and control of the chlorine surplus (=free chlorine: HOCl) successfully for many years. By the oxidation of organic impurities chloramines are formed (= combined chlorine: mono, di and trichloramine). Free chlorine and combined chlorine summed up result in the total chlorine amount.

The German standard DIN 19643-1 prescribes the limiting values for the concentration of free and combined chlorine in the water. It must be ensured constantly that these values are kept to and that the pool staff checks and records them daily when opening the pool, at lunchtime and before closing it. During the past years the demand for an automatic measurement / control of the combined chlorine concentration has been steadily increasing. According to the specialists, chloramines are considered to be damaging to health. Therefore the reduction of chloramines by means of appropriate measuring and control equipment should be aimed at (see also metering of activated-carbon powder - JESCO AKODOS).
As today online recording and display of the free chlorine concentration is standard and required, in the future this will also be the case for combined chlorine.

DCM01 chlorine sampling station

By combining the potentiostatic sensor for free chlorine measurent PM01 well-established for years, our sensor for total chlorine measurement and the strong calculating capability of the TOPAX NT controller and measuring amplifier, a differentiated measurement has become possible. The free and combined chlorine concentration can now be displayed and recorded constantly, and activated-carbon or fresh water is added according to demand.
The 100 % solution is called JESCO DCM01 – measure-regulate-control all parameters subject to recording online.
JESCO DCM01 is a measuring system with state-of-the-art sensors/electronics. Additional chemical required in automated chemical analyzing processes are not needed for the JESCO DCM01 system.

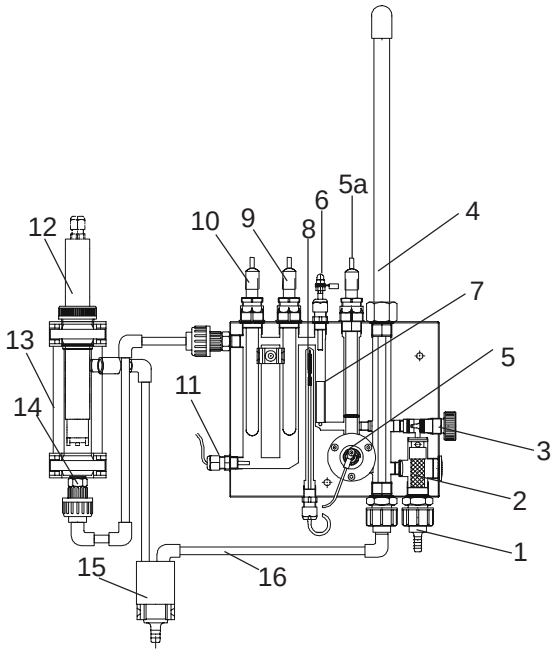


Function

The signals measured by the sensors for free chlorine, total chlorine, pH, redox, temperature and flow are transmitted to the TOPAX NT to be checked for plausibility and processed by using a special evaluation software. A separate device evaluating the measured values for total chlorine concentration is not required. In addition to the values measured by the sensors, the display shows the value for combined chlorine which results from the difference between total chlorine and free chlorine. The measured values for free, combined and total chlorine concentration are temperature and pH value-compensated.

The hydraulic system

The sample water flows through the hose socket (1) into the PMMA block where dirt particles are removed by passing the filter (2) first. The sample water flow is roughly preset with the help of the needle valve (3). The hydrostatic control valve (4) ensures a constant, continuous flow and eliminates any gas bubbles. The 3-electrode sensor for free chlorine (5) works according to the potentiostatic measuring principle with reference electrode (5a). A grounding pin (6) carries off any disturbance potential. The float (7) switches the right Reed contact (8) and confirms flow of sample water. The sensors for pH (9) and redox (10) are combined electrodes. A resistance feeler gauge (11) measures the temperature. The sensor assembly (13) accommodates the sensor for total chlorine (12), a precisely designed nozzle (14) makes sure that the oncoming flow is constant at the sensor. After passing the sensors, the sample water is routed without any pressure into the collecting funnel (15). The overflow of the hydrostatic control system (16) can be turned and is suitable to be used for tapping sample water for check measurements.



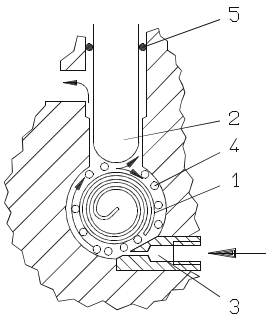
1 Hose socket
2 Filter
3 Needle valve
4 Hydrostatic control valve
5 Sensor for free chlorine
5a Reference electrode
6 Grounding pin
7 Float
8 Reed contact
9 pH sensor
10 Redox sensor
11 Resistance feeler gauge
12 Sensor for total chlorine
13 Sensor assembly
14 Nozzle
15 Collecting funnel
16 Hydrostatic control system

Sensors

Sensor for free chlorine

Free chlorine measurement at the sampling station PM01 works according to the potentiostatic method using a 3-electrode system (gold-KCl-stainless steel). The measuring principle is registering only free chlorine by means of a special evaluation electronic in the amplifier. Other ions, that generate a zero current when applying an amperometric sensor, will be ignored. Therefore potentiostatic operating sensors do not require a zero-point calibration.

The free chlorine sensor of the sampling station PM01 contains balls which rotate in the stream of water and thus ensure continuous cleaning of the electrodes (see drawing on the following page). After an initial phase of a few hours the electrodes have adapted to the water and operating conditions so that a long-term, stable measurement is possible. Manual cleaning of the electrodes in certain intervals is not necessary.



1 Gold electrode
2 Reference electrode
3 Nozzle for tangential water supply
4 Glass balls rotating in water for cleaning of the electrodes
5 O-ring for centering of reference electrodes

Sensor for total chlorine GCM
The sensor for total chlorine concentration GCM is a diaphragm-covered potentiostatic measuring cell. Due to the diaphragm the measuring system is insensitive to dirt, the potentiostatic measurement ensures stable values. Standard photometers are used to calibrate the sensor, e.g. according to the DPD method. For a detailed description, see data sheet MB 4 12 10.

Sensor for pH value and redox
The sensor consists of one combination electrode PE 110 and one combination electrode PE 110, with plastic shank and electrolyte gel (see data sheet MB 4 11 01). The sensors are installed in the block per PG plug connectors. During calibration, the sensors can be placed into the clamp outside the acrylic instrument block.

Sensor for water temperature
Thermometer probe PT 100 in metallic protective pipe.

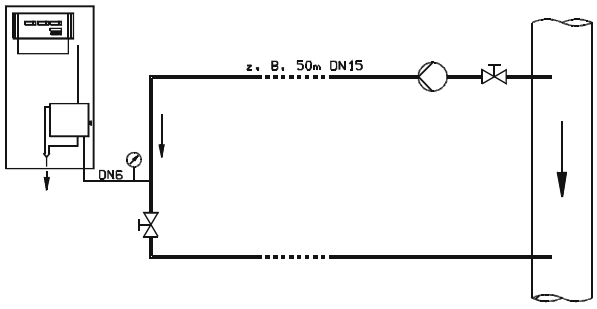
Sample water filter
Integrated in the acrylic instrument block is a filter (mesh 0.5 mm) for retaining small amounts of dirt in the sample water. If the sample water carries a high amount of residues, an additional filter (mesh e.g. 80µm) should be used.

Hydrostatic flow control
The flow of sample water is adjusted at the DN2.5 needle valve. An overflow at the acrylic instrument block ensures a continuous flow of sample water and allows entrained gas bubbles to escape. This guarantees a steady cleaning of the electrodes and consisting measuring of data. While the sensor requires a sample water flow of approx. 45 l/h the needle valve is normally set to 50 l/h so that excessive sample water must drain through the overflow pipe.

Flow control
A float switch in the acrylic instrument block indicates if the amount of sample water flowing is sufficient for a reliable measurement of free chlorien. A the sufficient flow the magnet in the float body closes a reed contact. If a shortage of sample water occurs, the reed contact opens. This allows the controller to shut down valves and metering pumps that are part of the control unit. Thus dangerous overdosage will be prevented.

Grounding
Quite often the measuring of free chlorine and pH value is affected by static electricity and other outside current sources in the sample water. Such current sources can be eliminated by connecting the grounding pin to the protective conductor. In very serious cases, a metal piece is installed in the sample water supply line additionally and also connected to the protective conductor.

Routing of sample water
Water inlet
The sample water is delivered through plastic pipes or hoses made from PVC or PE. Metal pipes must be avoided since they will consume the free chlorine of the sample water. The measuring result would be incorrect.
The sample water is to be routed without delay from the sampling point to the sensor. Short dead times are achieved by using shortest possible hose lines with smallest possible diameter. A 50m line DN 6 line causes a dead time of about 2 minutes. If the hose cross section has to be widened to DN 15 to avoid undesired pressure losses, the dead time will increase up to 10 minutes.
Therefore the installation shown below is recommended, when the distance between sampling point and sensor is too far.



The throttle valve builds up the pressure that is necessary at the needle valve of the instrument block for flow adjustment.
If the sample water can be expected to have a high amount of residuals, a separate filter (mesh e.g. 80µm) for the sample water should be applied (see installation examples). This occurs especially at outdoor swimming pools with the sample water taken directly out of the pool. Blossoms and leafs from the pool water might block the small filter of the acrylic instrument block. The filter inset should be cleaned or exchanged on a regular basis to avoid incorrect measuring due to chlorine consumption.

Water outlet
The acrylic instrument block has outlets for two different water flows. One originates from the overflow, the other originates from the sensor. Both water flows are gathered with a collector hopper in the center of the sampling station. The water for manual sampling is taken from the overflow pipe (swingable).
The water from the hopper must be released to the atmosphere. If the water shall be brought back into a pressure system, a submersible pump can e.g. be installed in a reservoir (see installation examples).

Scope of delivery

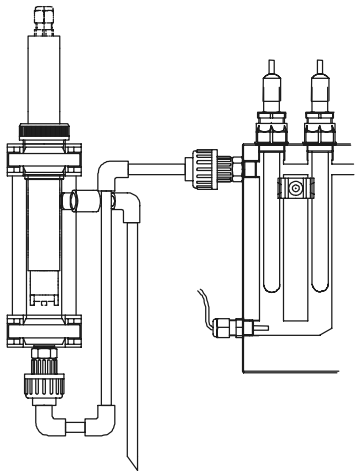
The "full version" includes TOPAX NT, all sensors, fixing material and small parts and is ready for connection upon delivery.
The sensors for total chlorine, redox, pH and the reference electrode are packed separately, for reasons of durability they are stored and and dispatched without electrolyte but with special protective caps.
Please observe small parts when unpacking and compare the contents with the delivery note.

Sampling station DCM01 with TOPAX NT
Full version with all sensors for measurement and display of:
- free chlorine
- combined chlorine
- total chlorine
- pH value
- redox potential
- temperature

Part No.: 23700701

For technical description of the TOPAX NT see data sheet MB 4 61 10.

Upgrade kit PM01 → DCM01
Includes all parts to prepare sampling station PM01 to allow measurement/display of free chlorine, combined chlorine and total chlorine. (PM01 as of 10/00)
Without sensors and without TOPAX NT
Requirements: TOPAX NT, GCM, Redox sensor, pH sensor, thermometer probe
Part No.: 37002

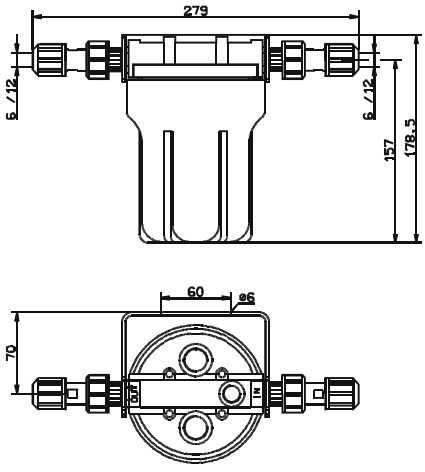


Technical data of sampling station GCM01

Measuring range for free chlorine	0-2ppm
Measuring range for total chlorine	0-2ppm
Measuring range for pH	pH 6.5 - pH 8.5
Measuring range for redox	0-1000mV
Measuring range for temperature	5°C - 55°C
Sample water consumption	45 l/h
Water pressure	0.2 - 6 bar
Dimensions (H/W/D in mm)	900x490x100

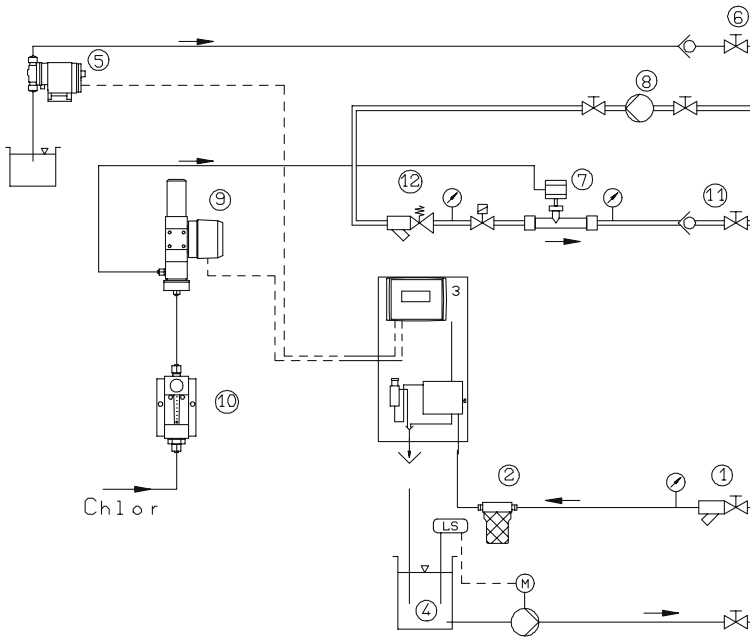
Accessories

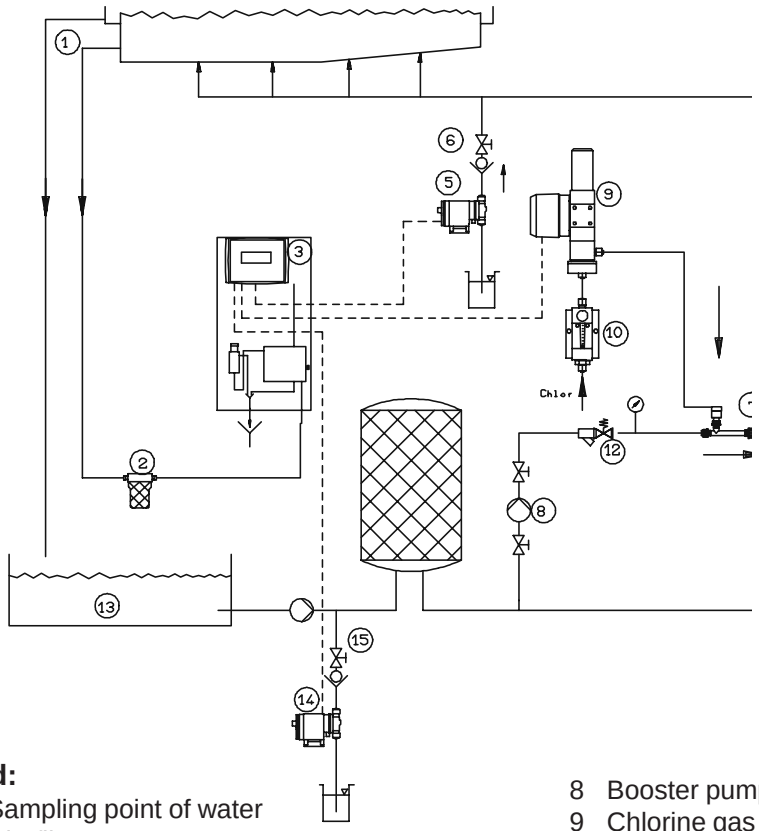
Separate 80µm sample water filter
with connections for tubing ø 6/12
and bracket for wall mounting
Part No. 23733816



Other equipment on request.

Installation examples





Legend:

1 Sampling point of water
2 Dirt filter 80µm
3 Sampling station PM01
4 Pump for recirculating sample water
5 Metering pump for pH correction
6 Injection point for pH correction
7 Ejector with non-return valve
8 Booster pump
9 Chlorine gas control valve
10 Chlorine gas flow meter
11 Injection point for chlorine solution
12 Flow regulator assembly
13 Pool overflow reservoir
14 Metering pump for activated carbon
15 Injection point for activated carbon