

User Guide

Chloride ion determination by coulometric titration in the medical and pharmaceutical field

CHLORIDE METER

CM 20



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2 Notes, Safety Notices and Warnings

The symbols and abbreviations defined below may appear on the packaging material, on the serial number plate or in the operating instructions:

	In vitro diagnostic device
	This product meets the requirements of EEC Directive 98/79 relating to in vitro diagnostic devices.
	Attention (refer to documentation)! Please follow the safety notices in the equipment operating instructions.
	“Use by ...” Indicate expiration date as <i>Year-Month</i> .
	Product batch description
	Article number or order number

The following pages provide a step-by-step introduction to using, maintaining and servicing the measurement equipment. Passages requiring special attention are marked as follows:

	This symbol warns of the danger of corrupting measurement results, for example, by improper use of beakers.
	This symbol warns of the danger of damaging the unit or the measurement system, for example, as a result of improper servicing.
	Note or tip.

Subject to errors and technical changes.

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Chloride Meter Model CM 20 / 2009

November 2015 Version 1.08

3 Introduction

3.1 Application fields of the Chloride Meter

The Gonotec Chloride Meter CM 20 is a non-invasive in-vitro diagnostic device. It is used to determine the chloride ion concentration in sweat, urine, serum and other body fluids. Its purpose is to provide information to help identify, diagnose, monitor and treat physiological conditions, states of health, and illnesses.

The equipment may only be operated by specialists or those persons whose training or skills have provided them with the necessary practical experience (see *MPBetreibV: German Medical Devices Operator Ordinance*).

3.1.1 Application Restrictions of the Chloride Meter

Please ensure that no other halogens, such as **fluoride**, **bromide** or **iodide** are present in the samples. Also, **no oxidizers** may be added to the samples.

Plausibility checks of the results must be performed by the doctor by means of the pertinent literature.

3.2 Chloride Meter Measurement Method

The Gonotec CM 20 chloride meter operates according to the principle of coulometric titration. Two silver electrodes—the generator electrodes (anode and cathode)—are dipped into a beaker filled with working solution (batch). The working solution consists of an acid buffer and a colloid stabilizer that keeps the silver chloride, which arises later on, in suspension.

Since the buffer does not contain any silver ions, the silver ion concentration, and thus the indicator current (see below) is brought to a specific end point. By means of a constant current (generator current) between the two silver electrodes, a constant amount of silver ions is released at the anode. The silver ion concentration is maintained by the measurement electrodes (indicator electrodes), which are dipped into the solution. By adding a chloride sample, the free silver ions form a non-soluble silver chloride precipitate together with the free chloride ions of the sample.

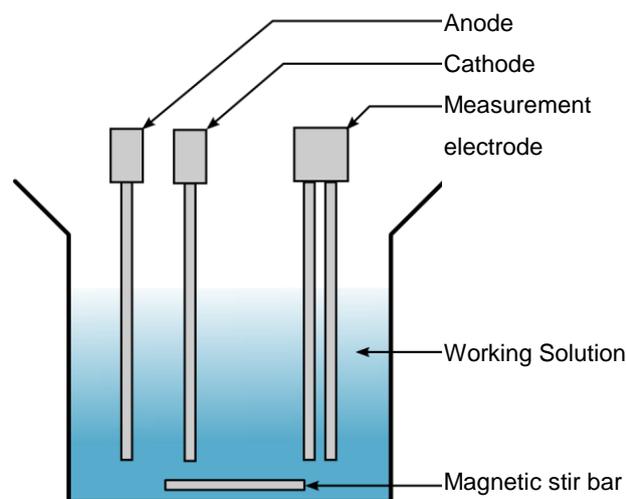
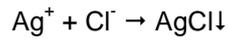


Fig. 1 Schematic Drawing "Coulometric Titration"



The indicator current drops and by controlling the generator current silver ions are released until all chloride ions are precipitated as silver chloride. This restores the original silver ion concentration (end point).

The period of flow of the generator current is measured during the titration process and is proportional to the chloride ion concentration.



Depending on the type of sample, no more than 50 measurements should be carried out using one batch of working solution.

3.3 Specification

Measurement display	0–999 mmol/l
Measuring range	10–999 mmol/l
Resolution	1 mmol/l over the entire measurement range
Sample volume	20 µl (nominal)
Reproducibility	±2 digit, 20 µl sample amount at 100 mmol/l
Linearity	±1 mmol/l or ±1% between 10–299 mmol/l

3.4 Unpacking the Chloride Meter

After receipt of the shipment, the Chloride Meter should be immediately unpacked and checked for obvious signs of damage sustained during shipping. If any damage is found, notify the manufacturer:

Gonotec GmbH	Tel.: (030) 7809588-0
GSG-Hof Reuchlinstr. 10–11	Fax: (030) 7809588-88
D-10553 Berlin	E-mail: contact@gonotec.com
	Web: www.gonotec.com

Toll-free service number for Germany: 0800 / 7846027

The packaging for this equipment was specially designed to ensure safe and hygienic transport. The packaging is re-usable. Please save the packaging in case the unit needs to be shipped back to Gonotec for repairs or servicing.

This will save you the time and money needed to find equally suitable packaging.

3.5 Packaging Contents

Check to make sure the contents of your shipment are complete. We cannot accept responsibility for any missing items reported at a later date.

Accessories and consumables included in the shipment

quantity	Item number	Item
1	60.00	Chloride meter CM 20
1	60.3.0010	Silver electrode (<i>anode</i> , red)
1	60.3.0020	Silver electrode (<i>cathode</i> , black)
1	60.3.0030	Measurement electrode
1	60.9.0001	Titration beaker (<i>special beaker</i>)
1	60.9.0002	Stir bar (magnetic)
1	60.9.0003	Magnetic stir bar retriever
1	60.9.0004	Cleaning kit for CM20 measurement electrode: Silver cleaning cloth and microfiber cleaning cloth
1	60.9.0010	Acid buffer solution (37×10 ml) and stabilizer (1×30 ml)
1	60.9.0100	Standard solution 100 mmol/l; packaged in 10 ampoules each
1	20.9.0100	Power cable
1		User Guide

A complete listing of accessories and consumables is located in the appendix.

4 Design of the Chloride Meter

4.1 Overview of Display and Connectors



Fig. 2 Frontal view of the Chloride Meter

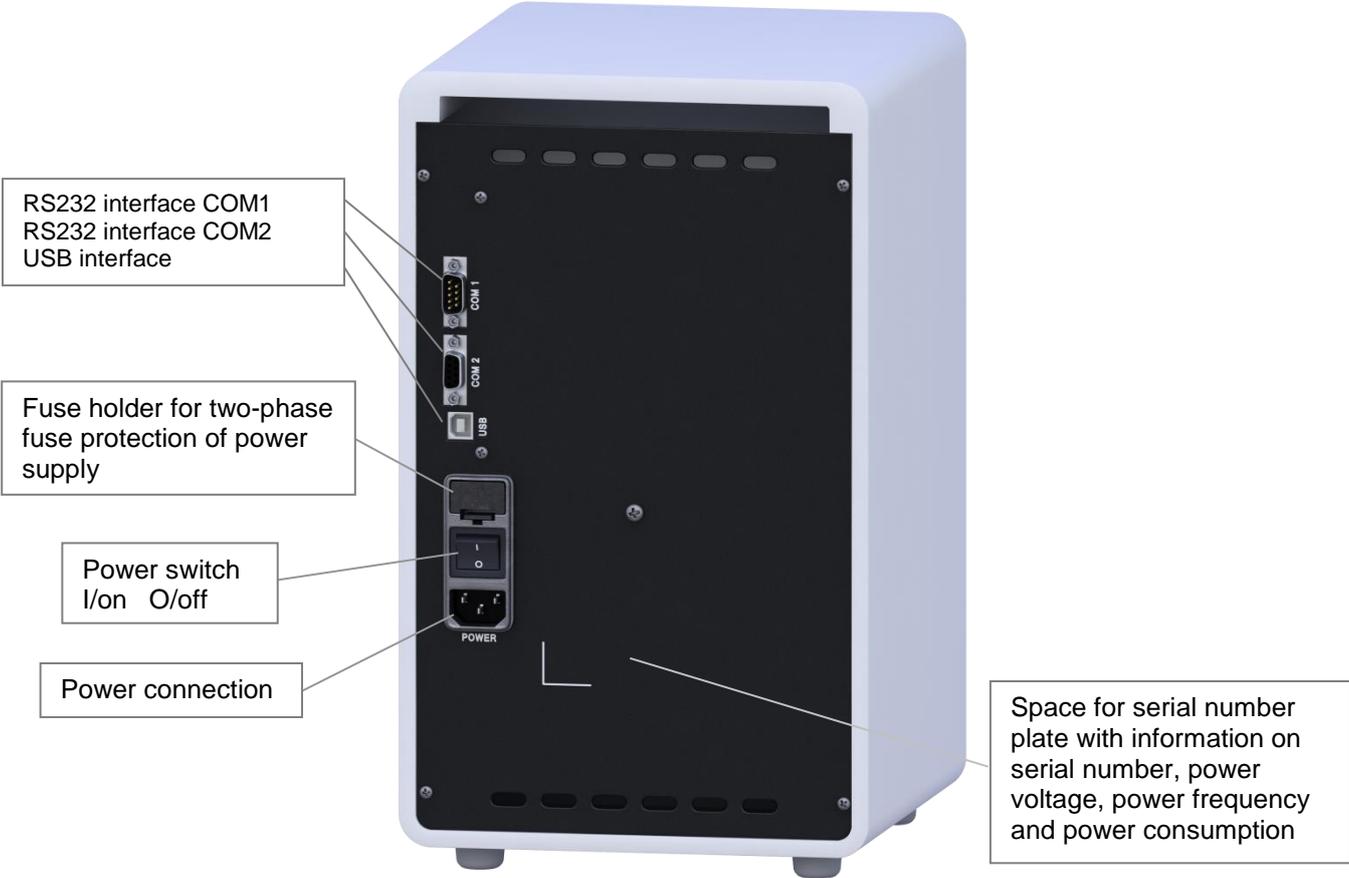


Fig. 3 Rear view of the Chloride Meter

4.2 Power Supply

Autoselective power supply: 100–120 VAC / 200–240 VAC, 50–60 Hz
Power consumption: 20 VA

4.3 Dimensions and Weight

Dimensions (width x depth x height): 205x220x360 mm
Weight: approx. 5.7 kg.

5 Setup and Initial Operation

Place the Chloride Meter onto a flat and solid surface, such as a laboratory table. Avoid direct sunlight onto the LCD touch screen so that instructions and measurement results can be easily read.

Use the power cord provided to connect the Chloride Meter from the power input socket at the rear of the unit to an **earthed power outlet**.



It is important to ensure that the voltage indicated on the serial number plate matches that of your electricity network. Incorrect voltage can cause the fuse in the power supply unit to blow.

Turn on the Chloride Meter CM 20 at the power switch at the rear. After a short self-test, the Welcome screen appears on the touch screen display. This screen is made up of three touch-sensitive fields: LANGUAGE, MEASURE and SETTINGS.

5.1 Safety and Handling Information

The Chloride Meter is an electric laboratory measurement device. It should therefore be handled according to the safety provisions and precautions for electric measurement, control, and laboratory equipment.

Warning: Class I devices must be connected to a power socket with protective ground wire.

If the power or device connector is used as a separation device, the connector must be easily accessible at all times. Remove the power plug from the power socket to safely disconnect the device from mains voltage.



If the equipment is to be **decommissioned**, make sure it is sufficiently **disinfected**. This will make sure that the equipment has been **decommissioned** in accordance with **local accident prevention guidelines** (UVV).

We recommend using detergents such as Mikrozid® AF Liquid, Bacillo® plus 3%, or Korsolex® plus 4% commonly used in clinical-chemical laboratories to clean and decontaminate the device.

The unit does not emit harmful substances either during operation or when switched off.

Symbols on the unit and its serial number plate meet the requirements of the following standards: DIN EN 61010-1, DIN EN 61010-2-101, DIN EN 61326, DIN EN 62304, DIN EN 62366, DIN EN 591, DIN EN 375 and DIN EN 980 (harmonized standard for medical devices according to § 3 No. 17 of the German Medical Device Law MPG).

Regarding the checking of meters, please refer to the applicable laboratory guidelines.

5.2 Known Risks during Use

An acid buffer and a stabilizer solution are used during measurement. Make sure you read the attached safety data sheets concerning appropriate safety measures and handling of these solutions.

6 Menu Structure of the Chloride Meter

Brief illustration of handling principle

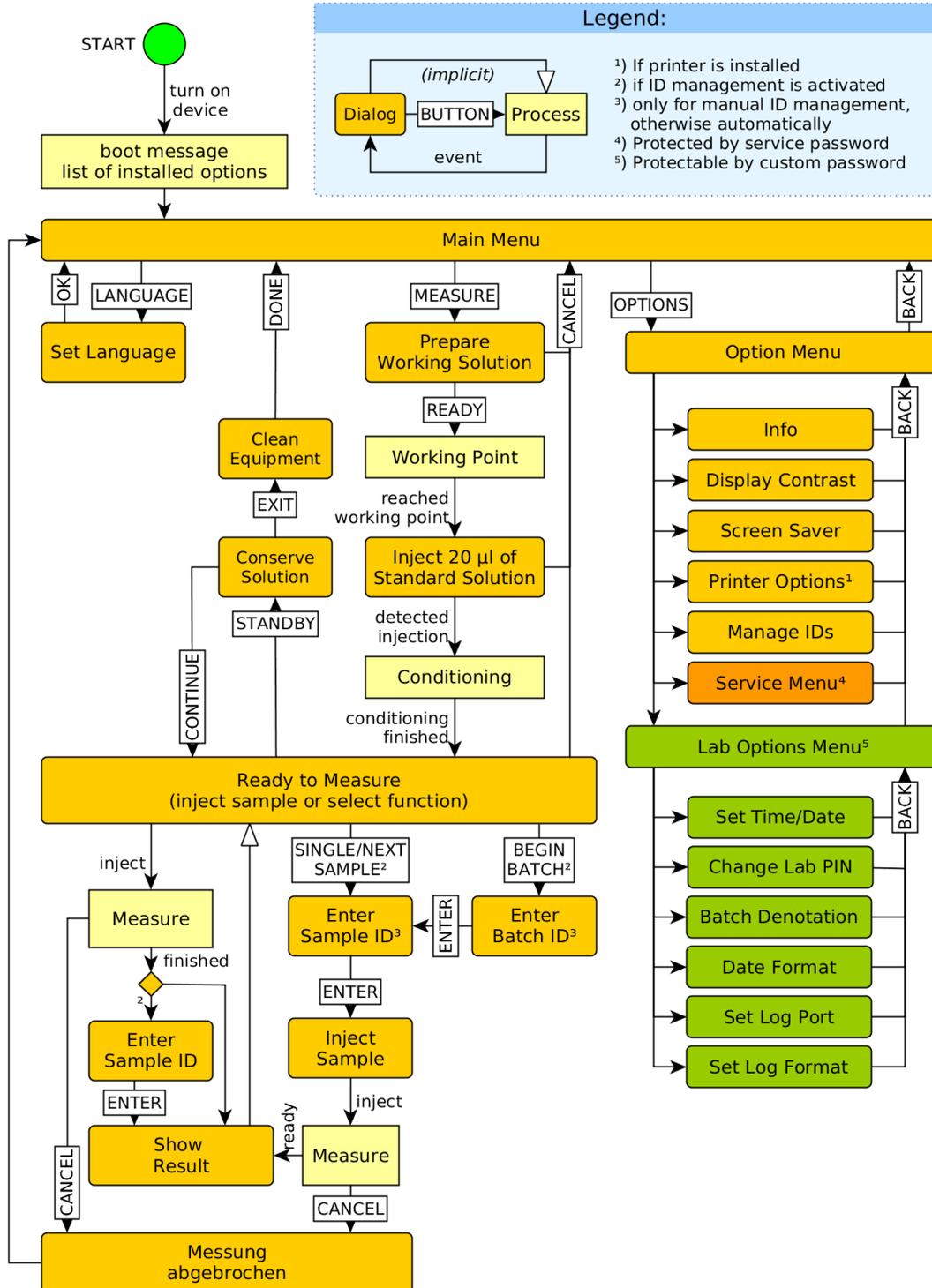


Fig. 4 Menu structure

6.1 Display and Keypad Overview



Fig. 5 Touch screen

6.2 Menu Functions

Operating the Chloride Meter CM 20 is very easy using the touch screen display. After you have turned on the equipment, you can initially select between the menu items **Language**, **Measure** or **Settings** by touching the corresponding symbol.

Language: You can select between German, English, Spanish, French and Brazilian Portuguese.

In the **Settings** menu item, you can perform basic settings. To leave this item, press BACK.

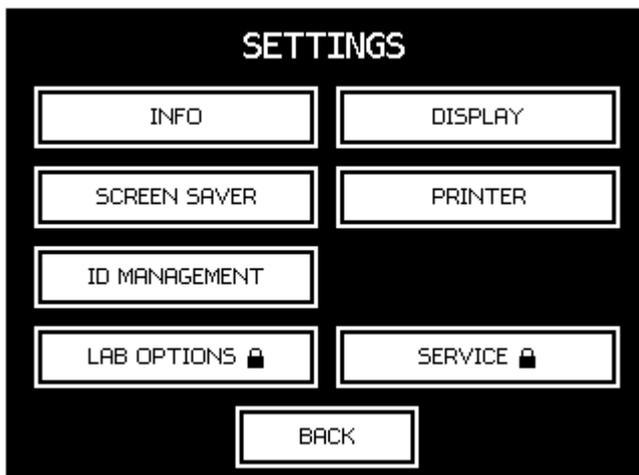


Fig. 6 Setting

Information: The serial numbers of the device and the current versions of the installed software are displayed.

Display: You can adjust the contrast of the device. Make sure that the device is set up such that no direct sunlight is directed at the screen.

Screen saver: You can select the amount of time until the screen saver activates, from 1 minute to one hour, or you can disable it completely.



In order to avoid damage to the screen, we urgently recommend that the screen saver is used!

Printer: If the device is equipped with a printer (Option D) you can, for example, trigger a paper feed to insert new paper.

ID management:

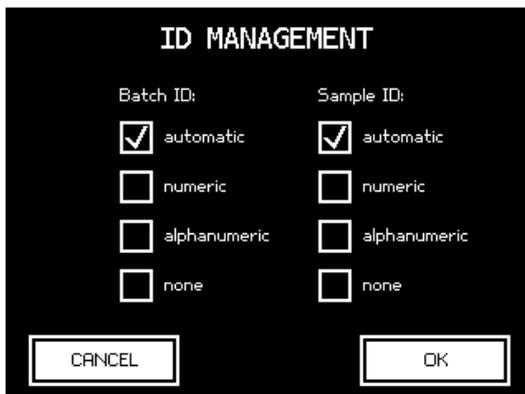


Fig. 7 Configure batch and sample ID

Select the type of IDs for series measurements (*Batch ID*) and individual samples (*Sample ID*).

The following options are available:

- **Automatic:** The samples and the batch IDs are assigned running numbers automatically. The counter resets daily. The counter for the individual samples in a series measurement resets when starting a new series measurement.
- **Numeric:** Numeric IDs are assigned manually. During measurements, the system prompts the user to enter the numeric ID of the sample or batch using the on-screen keyboard.
- **Alphanumeric:** Alphanumeric IDs are assigned manually. During measurements, the system prompts the user to enter the alphanumeric ID of the sample or batch using the on-screen keyboard.
- **None:** no sample or batch identification is performed.

Laboratory options:

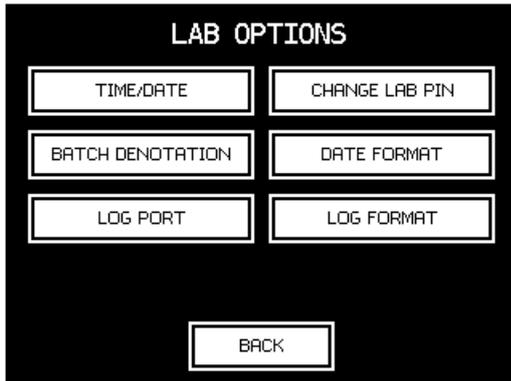


Fig. 8 Laboratory options

This menu item can be password-protected. This password is not pre-assigned at initial operation and can be freely selected by the lab supervisor. The password can be changed in the **Lab options** menu, but the previous password is required to access the menu.

Note: A lost password can only be reset by the manufacturer or their service provider. The service password is required.

The following setting options are available:

Time/date:

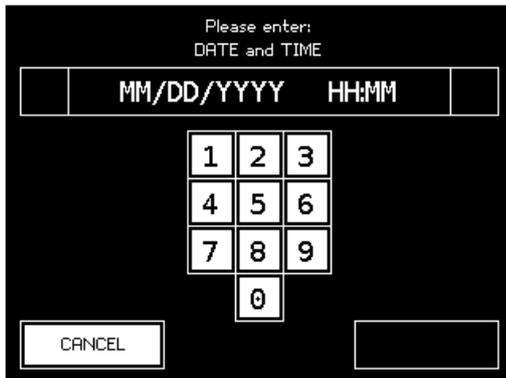


Fig. 9 Set date and time

Enter date and time as follows:

- DD – Day, two digits [01...31]
- MM – Month, two digits [1...12]
- YYYY – Year, four digits [2016]
- HH – Hour, two digits [00...23]
- MM – Minutes, two digits [00...59]

Date format:

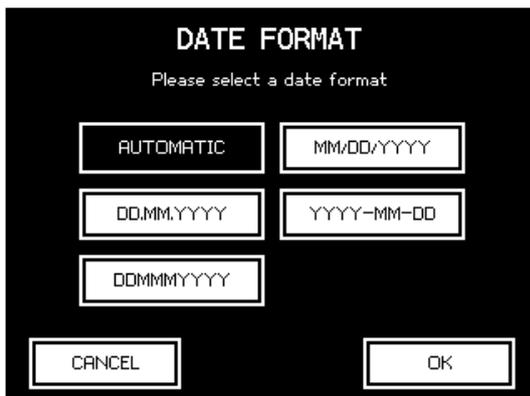


Fig. 10 Configure date format

Select the date format required:

- DD – Day, two digits [01...31]
- MM – Month, two digits [1...12]
- MMM – Month [Jan...Dec]
- YYYY – Year, four digits [2016]

If *AUTOMATIC* is selected the date format is determined by the language selected.

Batch denotation:



Select the desired batch denotation.

Fig. 11 Batch denotation

Please refer to the Chapter 9 *“Digital Data Output (COM)”* for information on the settings.

When you quit Settings, you will return to the start. Now you can begin with your measurements.

Touch the MEASURE button to start the procedure. The system starts the measurement sequence and leads you through the whole measurement using simple instructions. Please refer to Chapter 8 *“Measurement of a Sample Solution”* for detailed information on the sequence.

7 Calibration

The Chloride Meter is delivered in calibrated condition from the factory. Calibration by the user is not required.



Calibration is checked and if necessary recalibration is performed during an annual maintenance check or meter check (MTK) by the manufacturer or service agency.

8 Measuring a Sample Solution

8.1 Preparation

To prepare the measurement system, the measurement electrode is cleaned (refer to Chapter 8.6) and inserted into the measurement equipment. Insertion of the plug is easy since the connection pins are designed such that it is impossible to install the contacts the wrong way round.

Note: The measurement electrode can be easily replaced with one hand without the use of additional tools. However, do not insert or remove the electrode at an angle. During removal, the entire measuring equipment could be pulled down with it. Push the measurement electrode up until it is completely engaged (seated firmly).

Titration electrodes are inserted into the colored receptacles of the measurement equipment according to their color marking (red/black).

- 1 Add 20 drops of the stabilizer (*Gelatin Solution* 60.9.0010) to a 10 ml flask of acid buffer solution (*Acid Buffer Solution* 60.9.0010), seal the buffer flask shut and carefully turn it over a few times.
- 2 Make sure that the Chloride Meter is turned on and touch the field MEASURE on the touch screen display with your finger.
- 3 On the display, you will be asked to add the working solution that you just prepared (buffer and stabilizer) and the magnetic stir bar (60.9.0002) to the beaker (60.9.0001) of the Chloride Meter CM 20.
- 4 Place the filled beaker into the trough provided for it in the Chloride Meter.
- 5 Move the measurement sensor unit downward into the working solution.
- 6 Now touch the READY field.

 **Note:** You can end the process at any time by touching the CANCEL field. In the following step you will be prompted to remove the electrodes, the measuring probe (refer to Cleaning the Electrodes) and the solution. You will then be taken back to the Welcome screen.

- 7 In the following display, you will be asked to wait until the working point is reached. A runtime display under the message visualizes this process. Then, the system must be conditioned.



Fig. 12 Preparation

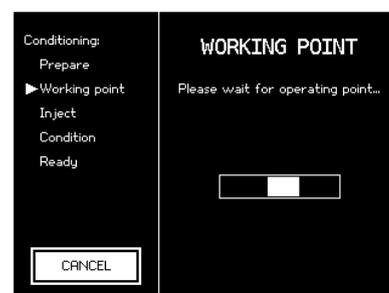


Fig. 13 Working point

8.2 Conditioning

Conditioning must always be done when the Chloride Meter is turned on, a measurement procedure or a measurement series has been canceled or if the working solution has been changed.

- 8 After the working point is reached, you will be asked to pipette 20 μl (0.02 ml) of the standard solution (100 mmol/l, 60.9.0100) into the working solution.
- 9 To do so, place an OPC ampoule (One-Point-Cut ampoule) of the 100 mmol/l standard solution onto a flat surface and hold it steady with one hand. With the other hand, break off the head of the ampoule carefully and with only slight pressure across the printed point on the neck of the ampoule.

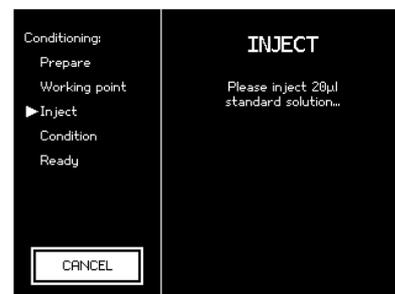


Fig. 14 Injecting Standard Solution



Warning: Do not try to break off the OPC ampoules across an arbitrary point of the neck or with force. You could be injured by the breakup of the entire ampoule.

- 10 Now place a correctly-sized pipette tip onto your 20 μl fixed volume microliter piston pipette or your multivolume pipette set to 20 μl . Press the piston of the pipette into the pipette up to the first pressure point and hold the piston there. Lead the pipette tip into the standard solution and leave the pipette tip in the solution during the filling phase. Allow the piston of the pipette to slowly and smoothly retract until the piston is relocated in its initial position. Make sure that you do not take in any air! Wait for a second and then remove the pipette from the solution. There are now exactly 20 μl of solution in the pipette tip. If you see drops on the outside of the pipette tip, carefully remove them with a lint-free paper tissue—do not draw off any solution from the pipette tip (through capillary forces of the paper tissue)—or repeat the process with a new pipette tip.
- 11 Place the pipette with the filled pipette tip into the working solution located in the Chloride Meter. Use one of the two guides on the measurement equipment as a guide. Dip the tip into the working solution and press the piston up to the second pressure point in order to completely eject the solution. Pull the pipette out of the working solution with the piston pressed. Make sure that you do not pipette the solution at the electrodes or at the wall of the beaker. Pipette the solution directly into the working solution as close to the center as possible.
- 12 The Chloride Meter recognizes the addition of the standard solution automatically, whereupon the message CONDITIONING IN PROGRESS... will display.
- 13 After the conditioning is completed, a measurement should be taken using the 100 mmol/l standard solution (60.9.0100) to check the calibration.

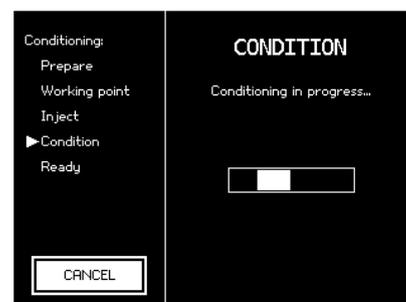


Fig. 15 Conditioning

8.3 Executing a Sample Measurement (without ID management)

If “none” is selected twice in ID Management, the following procedure should be followed for a sample measurement:

 If a printer is installed (Option D) and the USE PRINTER box is activated, the measurement is documented without a sample ID when ID management is disabled.
Irrespective of this, the measurement results are always transferred on the selected interface (COM2/USB) (again with no sample ID).

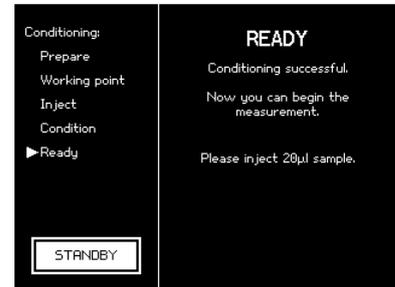


Fig. 16 Sample measurement

- 1 Before each sample series, the calibration of the Chloride Meter should be checked using the 100 mmol/l standard solution.
- 2 After conditioning is finished, add 20 µl of your sample solution (sweat, urine, serum or standard solution/control solution). Follow the instructions from the chapter 8.2 “Conditioning” with regard to the correct way to add sample.
- 3 The Chloride Meter automatically recognizes that sample has been added, and begins the measurement. The message MEASUREMENT will display. You can track the measurement visually through the incremental display value. If you would like to cancel the measurement, touch the CANCEL field.
- 4 After the measurement is finished, the message RESULT and the result value in mmol/l are indicated on the display.
- 5 If you would like to take another sample, pipette another 20 µl of the solution into the beaker. If you would like to end the measurement series, touch the STANDBY field to enter standby mode and then touch CANCEL on the touch screen display.

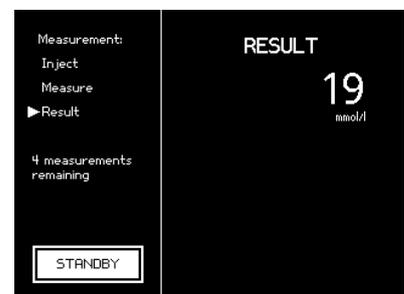


Fig. 17 Successful measurement

 **Note:** If the Chloride Meter does not automatically begin upon addition of the sample, it is probably because the chloride concentration is less than 10 mmol/l. In this case, increase the concentration using the standard solution by adding 20 µl of the standard solution (60.9.0100). Subtract the 100 mmol/l of the standard from the displayed final result.

8.4 Executing a Sample Measurement (with ID management, single sample)

Every sample can be assigned a unique sample number (Sample ID). This can be done manually or automatically depending on the setting.

 If a printer is installed (Option D) and the USE PRINTER box is activated, the measurement is documented together with the sample ID. Irrespective of this, the measurement results are always transferred on the selected interface (COM2/USB).

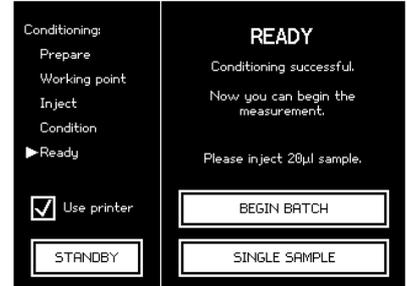


Fig. 18 Single sample with printer

- 1 Before each sample series, the calibration of the Chloride Meter should be checked using the 100 mmol/l standard solution.
- 2 After conditioning is finished, press the SINGLE SAMPLE button on the touch screen. If automatic sample numbering is activated you will be prompted to inject the sample solution. If manual numbering is activated you will be prompted to enter a sample number and then to inject the sample. Alternatively, you can also inject your sample without pressing the SINGLE SAMPLE button. If manual numbering is activated you will be asked for the sample number when the measurement is completed.
- 3 Now add 20 µl of your sample solution (sweat, urine, serum or standard solution/control solution). Follow the instructions from the chapter 8.2 “Conditioning” with regard to the correct way to add sample.
- 4 The Chloride Meter automatically recognizes that sample has been added, and begins the measurement. The message MEASUREMENT will display. You can track the measurement visually through the incremental display value. If you would like to cancel the measurement, touch the CANCEL field.
- 5 After the measurement is finished, the message RESULT and the result value in mmol/l are indicated on the display. The result is also outputted on the printer.
- 6 If you would like to take another sample, pipette another 20 µl of the solution into the beaker. If you would like to end the measurement series, touch the STANDBY field to enter standby mode and then touch CANCEL on the touch screen display.

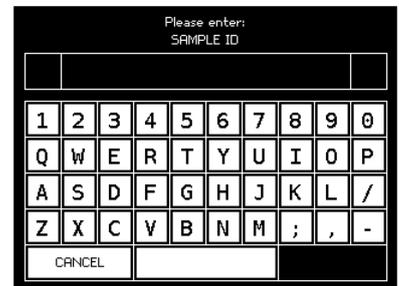


Fig. 19 Sample numbering

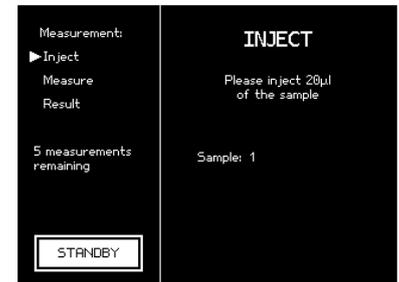


Fig. 20 Sample injection

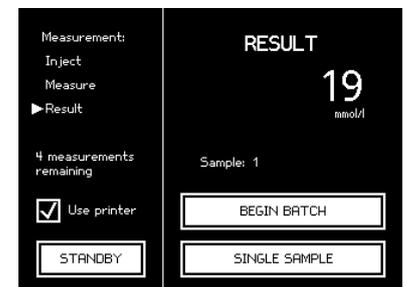


Fig. 21 Measurement reading

8.5 Executing a Sample Measurement (with printer, batch)

Every batch can have a unique batch number (Batch ID) and every sample in this batch can have a unique sample number (Sample ID) within this batch. Both can be done manually or automatically depending on the setting.

If a printer is installed (Option D) and the **USE PRINTER** box is activated, the measurement is documented together with the batch ID and sample ID. Irrespective of this, the measurement results are always transferred on the selected interface (COM2/USB).



- 1 Before each sample series, the calibration of the Chloride Meter should be checked using the 100 mmol/l standard solution.
- 2 After conditioning is finished, press the **BEGIN BATCH** button on the touch screen. If both batch and sample numbering are set to automatic you will be prompted to inject the sample solution. If manual numbering of batches and/or samples is activated you will be prompted to enter a batch and/or sample number and then to inject the sample. If you have already started with a batch in a previous measurement you also can inject the next sample in this batch directly without pressing the **NEXT SAMPLE** button. If manual numbering is activated you will now be asked for the sample number when the measurement is completed.
- 3 Now add 20 µl of your sample solution (sweat, urine, serum or standard solution/control solution). Follow the instructions from the chapter 8.2 “Conditioning” with regard to the correct way to add sample.
- 4 The Chloride Meter automatically recognizes that sample has been added, and begins the measurement. The message **MEASUREMENT** will display. You can track the measurement visually through the incremental display value. If you would like to cancel the measurement, touch the **CANCEL** field.
- 5 After the measurement is finished, the message **RESULT** and the result value in mmol/l are indicated on the display. The result is also outputted on the printer.
- 6 If you would like to take another sample, select **NEXT SAMPLE** or pipette another 20 µl sample directly into the beaker.
- 7 Touch the **END BATCH** field to end the batch.



Fig. 22 Batch measurement with printer

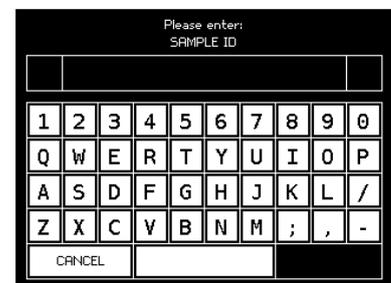


Fig. 23 Sample numbering (batch)

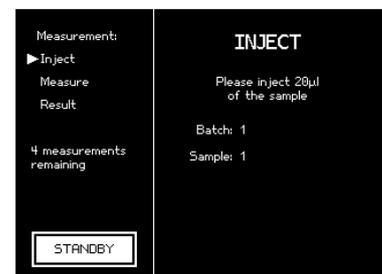


Fig. 24 Sample injection (batch)



Fig. 25 Measurement result (batch)

This returns you to single sample mode. If you would like to end the measurement series completely, touch the STANDBY field to enter standby mode and then touch CANCEL on the touch screen display.

8.6 Cleaning the electrodes

When the measurement series is completed, the anode and cathode should be rinsed in distilled water and dried with a lint-free cloth.

The measuring probe is cleaned in several steps:

1. Rinse with distilled water.
2. Dry with a lint-free cloth.
3. Clean the ends of the measurement electrode with the silver cloth.

Do this by rubbing the ends of the measurement electrode over the silver cloth on all sides until dark streaks appear on the silver cleaning cloth.

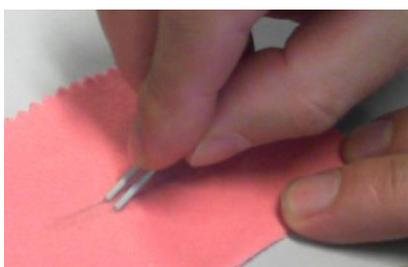


Fig. 26 Cleaning with the silver cleaning cloth



Fig. 27 Dark streaks

4. Repeat the same procedure with the damp microfiber cloth.

5. Rinse with distilled water.
6. Dry with lint-free cloth.



Fig. 28 Cleaning with the microfiber cloth

Please store the cleaned electrodes in their designated, sealed shipping tubes.

9 Digital data output

Three digital data ports are located on the back of the Chloride Meter CM 20.

The upper COM1 (RS232) serial data port is used to connect a barcode reader (optional). The barcode reader is configured at the factory and can be purchased from Gonotec GmbH or your authorized distributor.



The use of a barcode reader other than the barcode reader supplied by Gonotec GmbH is not recommended because potential incompatibilities cannot be ruled out.

The Chloride Meter CM 20 can output the recorded measurement results via the COM2 (RS232) serial data port in the middle or the USB port.

To select the data port, select **Lab options** in the **Settings** menu. This contains the **Log port** option. The following screen lets you select between **COM2** and **USB**.

A test line can be sent to test the data connection.



Fig. 29 Log port

A software driver is required to use the USB port.

There are two methods for installing the driver:

- **Automatic:** Connect the Chloride Meter CM 20 to the PC using the USB cable and switch it on. The operating system of the PC detects the interface, automatically installs the required software driver and notifies the user that installation was successful. The USB port can now be used as an additional COM interface.
- **Manual:** The PC does not automatically detect the device or the operating system is missing the required software driver.

In this case, please follow the instructions on the included CD. It includes both the installation instructions for the corresponding Windows operating system and the software driver itself.



To protect life and equipment:

Devices and accessories connected to the RS232 or USB connectors must meet the applicable safety standards for medical lab equipment.

9.1 Log formats

The log for the Chloride Meter CM 20 may optionally be published in the following three formats:

<i>Format</i>	<i>Description</i>	<i>Advantages</i>	<i>Disadvantages</i>
CSV	<ul style="list-style-type: none"> line by line comma-separated values placed within quotation marks 	<ul style="list-style-type: none"> compact can be uploaded into spreadsheets (e.g. OpenOffice or Excel) easily human-readable checksum acts as backup 	<ul style="list-style-type: none"> not a genuine standard format
XML	<ul style="list-style-type: none"> standardized extensible markup language 	<ul style="list-style-type: none"> standardized compatible with large number of APIs human-readable checksum acts as backup 	<ul style="list-style-type: none"> not very compact
Legacy CSV	<ul style="list-style-type: none"> CSV format from previous generations of devices 	<ul style="list-style-type: none"> compatible with legacy devices and interfaces 	<ul style="list-style-type: none"> syntax not always clear may cause data to be misinterpreted For reasons of security we strongly advise against continuing to use this format!

A more detailed description of the formats is provided below.

9.2 Data transfer

Data is transferred via the serial interface in the laboratory options with the transfer parameters set as follows.

<i>Parameter</i>	<i>Value</i>
Rate	9600 baud
Data bits	8
Parity	None
Stop bit	1
Coding	ASCII

These settings are also usually referred to as **9600/8N1**.

9.3 General options

The following options can be set for all formats using the laboratory options.

9.3.1 End of line markers

The end of each displayed line can optionally be marked as follows.

<i>Name</i>	<i>Description</i>	<i>ASCII</i>
CR	Carriage return	0x0D
CRLF	Carriage return and line feed	0x0D 0x0A

The end of the line is marked as ↵.

9.3.2 End of ticket markers

An “end of ticket” marker can optionally be implemented. This setting means that a line is displayed as follows after each individual sample measurement or after the end of the batch:

EndOfTicket↵

9.4 CSV format

If CSV format is selected, the log is displayed line by line. Each line is separated by the end of line symbol selected in the laboratory options. There are three types of line content:

<i>Type</i>	<i>Purpose</i>
Intro	Message showing version numbers of the instrument
Title	Column title of the next table of result lines
Result	Measurement result or error message

9.4.1 Line group

Every line within the CSV format contains several semicolon-(**ASCII:0x3B**)separated values which are if required contained within quotation marks (**ASCII:0x22**). Whether or not quotation marks are used depends on the value format. They are not used for measurements or times, but they are used for text values.

9.4.2 Intro line

When the Chloride Meter CM 20 is started, the instrument publishes a line with version information to prevent future compatibility problems. This line contains the short name of the device type followed by the version numbers of the mainboard and the components connected to it. A typical intro line looks like this:

CM20;Main:V1.80;COM:V1.7;D:V1.10↵

Note: Changing the settings restarts the logbook and also publishes a new intro line.

9.4.3 Title line

The intro line is followed by a line with title names for the values of the next result lines. This line helps to make the text human-readable and generates practical column titles when imported into a spreadsheet.

```
"batch"; "sample"; date; value; "dimension"; "device-  
no"; "check"; "message" ↵
```

Note: Changing the settings restarts the logbook and also publishes a new column title.

9.4.4 Result line

After each measurement a result line is published which contains the following semicolon-separated values in a fixed order:

<i>Column</i>	<i>Description</i>
batch	Batch identifier in quotation marks, entered by the user or a sequential number generated automatically. Or: Void for single measurements and if batch ID is disabled in the options.
sample	Sample identifier in quotation marks, entered by the user or a sequential number generated automatically. Or: Void if sample ID is disabled in the options.
date	Date and time in combined ISO 8601 format (e.g.: 2015-12-31T13:45).
value	Measurement as floating point number with a point as decimal separator (ASCII: 0x2E)—regardless of the language setting of the instrument! Or: Error identifier (see Error messages section)
dimension	Unit of the measurement value published in quotation marks in value (" mmol/l ") – regardless of the language setting of the instrument! Or: Void if value contains an error message.
device-no	Serial number of the device in quotation marks.
check	Checksum of previous values in this line (see Checksum section)
message	Human-readable message in user language in quotation marks. Or: Void if there is no notification.

9.5 XML format

The XML format is published line by line but a single record will generally extend across several lines. Each record is imported as a ticket and multiple measurements for one batch are combined into one ticket. Strictly speaking, records are allocated to tickets in the same way as they are published: Each printed record corresponds to one ticket in the XML log.

There are two types of ticket:

<i>Type</i>	<i>Description</i>
SAMPLE	Contains exactly one result from a single measurement
BATCH	Contains several results from a batch measurement

9.5.1 Ticket

A ticket consists of an *XML tag* which corresponds to one published ticket. If it relates to a single measurement, it contains an additional *XML tag* called **Measurement**, which contains the measurement and the associated metadata. If it relates to a batch measurement, one ticket may contain several measurements.

A ticket has the following attributes in addition to the measurements contained in it:

<i>Attribute</i>	<i>Description</i>
class	Ticket type (SAMPLE or BATCH)
serialno	Serial number of the device
versions	Version information on the device and connected components (see <i>Intro line</i> in the <i>CSV format</i> chapter)

9.5.2 Measurement

A measurement or mismeasurement is described in a ticket in an XML tag called **Measurement**, which contains the following values:

<i>Value</i>	<i>Description</i>
BatchId	Batch identifier, entered by the user or a sequential number generated automatically. Or: Not present for single measurements and if batch ID is disabled in the options.
SampleId	Sample identifier, entered by the user or sequential number generated automatically. Or: Not present if sample ID is disabled in the options.
DateTime	Date and time in combined ISO 8601 format (e.g.: 2015-12-31T13:45).

<i>Value</i>	<i>Description</i>
Value	Measurement as floating point number with a point as decimal separator (ASCII: 0x2E)—regardless of the language setting of the instrument! Or: Not present if it is a mismeasurement.
Unit	Unit of the measurement value published in quotation marks in value ("mmol/l") – regardless of the language setting of the instrument! Or: Not present if it is a mismeasurement.
Failure	Error identifier (see Error messages section) Or: Not present if measurement was successful.
DeviceNo	Serial number of the device
Checksum	Checksum of previous values in this line (see Checksum section)
Message	Human-readable message in user language. Or: Not present if there is no notification.

9.5.3 Example of a single measurement

In the case of a single measurement the entire ticket is published in one piece when the measurement has been completed, the value **BatchId** does not apply.

```
<Ticket class="SAMPLE" serialno="CM2161103"
versions="CM20;Main:V1.80;COM:V1.7;D:V1.10">␣
  <Measurement>␣
    <SampleId>PROBE01</SampleId>␣
    <DateTime>2016-02-19T08:34:30</DateTime>␣
    <Value>113</Value>␣
    <Unit>mmol/l</Unit>␣
    <DeviceNo>CM2161103</DeviceNo>␣
    <Checksum>30f206dbbe960bed80f707f7e447efc7</Checksum>␣
  </Measurement>␣
</Ticket>␣
```

9.5.4 Example of a batch measurement

If a new batch is initiated, a section is published which opens the ticket as an *XML tag* in the log:

```
<Ticket class="BATCH" serialno="CM2161103"
versions="CM20;Main:V1.80;COM:V1.7;D:V1.10">␣
```

If measurements are then implemented within the batch, a **Measurement** XML tag follows for each measurement such as the following:

```

<Measurement>␣
  <BatchId>CHARGE01</BatchId>␣
  <SampleId>PROBE01</SampleId>␣
  <DateTime>2016-02-19T08:38:02</DateTime>␣
  <Value>19</Value>␣
  <Unit>mmol/l</Unit>␣
  <DeviceNo>CM2161103</DeviceNo>␣
  <Checksum> a173e3f754290e77f1b5ac689d3d2486</Checksum>␣
</Measurement>␣
    
```

Ending the batch also closes the ticket:

```

</Ticket>␣
    
```

9.6 Legacy CSV format

Documentation in the obsolete CSV format can be requested separately. We strongly advise against continuing to use this format!

9.7 Error messages

The following error messages may be used to diagnose an operating error or device failure:

<i>Notification</i>	<i>Meaning</i>
ABORT	User cancels by pressing the EXIT key
LIFT	User cancels by lifting the sensor
MFAIL	Measurement could not be completed successfully
CFAIL	Conditioning could not be completed successfully
MABORT	Measurement was canceled
IFAIL	Unexpected injection of sample
EXHAUST	Working solution has been used up

9.8 Checksums

The checksum for each result line is calculated from the contents of the values from the columns *Batch ID*, *Sample ID*, *Date/time*, *Measurement*, *Unit* and *Device number*. A possible result line:

```
<Measurement>
  <SampleId>PROBE01</SampleId>
  <DateTime>2016-02-19T08:38:02</DateTime>
  <Value>19</Value>
  <Unit>mmol/l</Unit>
  <DeviceNo>CM2161103</DeviceNo>
  <Checksum> a173e3f754290e77f1b5ac689d3d2486</Checksum>
</Measurement> ↵
```

...Or...

```
;"PROBE01";2016-02-19T08:38:02;19;"mmol/l";"CM2161103";
" a173e3f754290e77f1b5ac689d3d2486";
↵
```

...and the above contents are strung together to form:

```
PROBE012016-02-19T08:38:02mmol/lCM2161103
```

The MD5 checksum for this string is:

```
a1 73 e3 f7 54 29 0e 77 f1 b5 ac 68 9d 3d 24 86
```

10 Maintenance of the Chloride Meter

10.1 Replacing the measurement electrode and titration electrodes



Pull out the power plug of the equipment!

Risk of electric shock!

For purposes of replacement or cleaning, the measurement electrode can be manually pulled out downward, and can be inserted upward. Insertion of the plug is easy since the connection pins are designed such that it is impossible to install the contacts the wrong way round.

Note: The measurement electrode can be easily replaced with one hand without the use of additional tools. However, do not insert or remove the electrode at an angle. During removal, the entire measuring equipment could be pulled down with it. Push the measurement electrode up until it is completely engaged (seated firmly).

Titration electrodes are inserted into the colored receptacles of the measurement equipment according to their color marking (red/black).

10.2 Comparison Control Measurements

A comparison control measurement must be carried out and documented according to applicable laboratory guidelines, using a 3-level control solution (e.g. SS-150, Wescor[®], Inc.). If a control measurement deviates from the prescribed target range, the manufacturer or the service agency must be notified.

10.3 Safety Checks

Safety checks should be conducted in accordance with relevant accident prevention guidelines. For annual maintenance (safety checks/meter checks), contact your dealer or Gonotec.

10.4 Meter Checks

Once per year, a meter check and calibration must be carried out by the manufacture or service agency. Nonetheless, the user should perform the following checks:

Control measurements must be carried out in accordance with applicable laboratory guidelines.

Measurement readings and any evaluation results must be logged.

If the system is to be used for immediate diagnostics for patients, RiliBÄK requires the following: "In such cases ... a single control sample measurement must be done at least once per week if patient samples are examined through this process during the respective calendar week." * We recommend that the 3-level control solution SS-150 of Wescor[®], Inc. be used.

*s. Guidelines of the German Medical Association for Quality Assurance of Medical Laboratory Investigations Volume 7, Feb. 15, 2008 Par. 2.1.5

10.5 Internal Quality Checks

A programmable microcontroller monitors the unit's functions. The failure of individual functional groups in the unit results in a malfunction that either triggers an error message or shuts down the unit.

10.6 Settings

10.6.1 Setting the Date and Time

Date and time can be changed in the **Setting** menu → **Lab options**. Access to this setting can be password-protected. The password is assigned by the lab supervisor at startup.

The lab supervisor can use this password to generate a new password in the **Change Lab PIN** menu item (also in the **Lab Options** menu) at any time; this invalidates the old password.

10.6.2 Function Checking

Only accessible by the manufacturer or by a service partner.

10.6.3 New initialisation

When you return the unit to its factory settings, the entire system is re-started and re-initialized.

10.7 Printer Maintenance

Ensure that no foreign objects enter the unit during unit maintenance work. The mechanics and the measurement system could be damaged when restarted.

10.7.1 Printer Paper Change

Press the *paper feed* button in the **Settings** menu → **Printer** to eject any remaining paper from the printer. Do not pull on the paper since this could damage the printing device.

1. Carefully pull on the knob on the printer cover.
The printer unit can now be pulled out of the housing. Remove the empty roll core from the carriage.

2. Insert a new paper roll.
Ensure the correct feed direction of the paper roll.
3. Cut the paper end cleanly and insert it from above into the paper slot.
Press and hold the *paper feed* button until approx. 2 cm of paper is protruding from the housing.
4. Push the printer unit back into the housing; a slight latching will be felt.

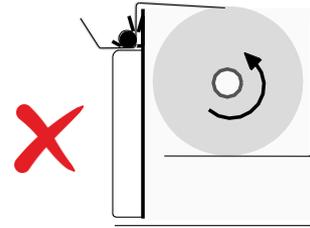


Fig. 30 Incorrect feed direction

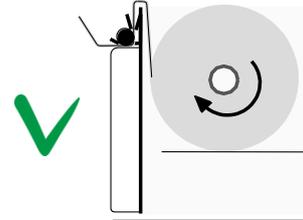


Fig. 31 Correct feed direction

10.7.2 Ribbon Change

The ink ribbon cassette must be replaced when the printout no longer has sufficient contrast.

1. Carefully pull on the knob on the printer cover. The printer unit can now be pulled out of the housing.
2. Lift the printer cover to remove it.
3. Tear off any paper protruding from the slot before replacing the ribbon.
4. Press lightly on the right side of the ribbon cartridge.
The cassette is released from the printer.
5. Take out a new ribbon and use your index finger to twist the knob clockwise and tighten the ribbon.
6. Insert the ribbon in the printer. The paper must be between the ribbon and the ribbon cassette. Tighten the ribbon by twisting the knob again.
7. Press and hold the *paper feed* button until approx. 5 cm of the printer paper is protruding from the housing.
8. Thread the paper through the slot on the printer cover and replace the cover on the printer.
9. Push the printer back into the housing.

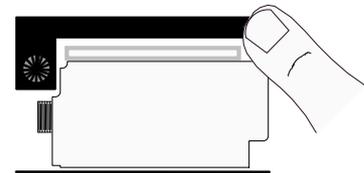


Fig. 32 Replacing the ribbon

10.7.3 Replacing a Defective Power Fuse



Before replacing a defective power fuse, ***unplug the unit from the power supply! Risk of electric shock!***

To replace the fuses, use a small screwdriver to remove the fuse holder on the rear of the unit. The two fuses can now be replaced. The unit has two-phase protection. Use **HBC fuses with a switching capacity of 1500 A only.**

200–240 VAC power supply: 1 A slow/LAG

100–120 VAC power supply: 1 A slow/LAG



Fig. 33 Replacing a power fuse

10.7.4 Forfeiture of Measurement System Warranty

Use of non-supported measurement or titration electrodes that will destroy the measurement system, even if done during the warranty period, shall result in forfeiture of the warranty claim of repair or replacement of the measurement system.

11 Error Messages and Troubleshooting

The following explains the error messages reported by the unit along with their possible causes.

11.1 Classification of Malfunctions by Component Group

The following presents an overview of the individual component groups, identifying the function of each component, its potential malfunctions, the effects of the malfunctions on the measurement system, the possible causes of the malfunctions and the procedure for correcting each malfunction.

It is thus of no consequence whether these malfunctions occur during conditioning or during a sample measurement.

Some errors can be remedied directly by the user or an in-house medical equipment technician; other errors require return of the unit to the manufacturer.

Components Function	Malfunction	Effect	Possible Cause	Measure
Titration electrode Anode Cathode	- fluctuating measurement values during measurement of the standard	- no plausible measurement values	- contaminated electrodes - mechanically defective electrode	- clean the electrodes with the silver cleaning cloth and then rinse with distilled water - replace the electrodes
Measurement electrode	- conditioning not successful	- unable to begin the measurement series	- contaminated electrodes - mechanically defective electrode	- clean the measurement electrodes with the silver cleaning cloth and then rinse with distilled water - replace the measurement electrode
Working Solution	- conditioning fails	- unable to begin the measurement series	- incorrect or used working solution	- use new original solution
Pipette	- fluctuating measurement values	- no plausible measurement values	- pipette defective or incorrect use of the pipette - incorrect sample volume	- examine pipette and examine the handling of the pipette

Table 1 Cause and remedy of malfunctions

12 Buffer, Stabilizer and Standard Solutions

12.1 Provisions of Certification

CE compliance requires that the buffer, stabilizer and standard solutions and accessories be used in the manner described in this manual. Any deviation from the specifications or independent modifications of the buffer, stabilizer and standard solutions or accessories without the express consent of the manufacturer may result in a violation of CE requirements. Such actions invalidate the compliance statement and transfer responsibility to the originator of said actions.

12.2 Composition

Standard solution (60.9.0100) contains 100 mmol/l of sodium chloride in distilled water. The precise concentration information is contained in the analysis certificate for each batch.

The acid buffer consists of a diluted acetic acid/nitric acid solution.

12.3 Safety and Handling Information

12.3.1 Standard Solution

The standard solution is not dangerous according to EC Directive 67/548/EEC.	
Poison class (Switzerland):	F (no poison class)
German water hazard class (WGK):	1 (slightly hazardous to water)
Storage class (German association of chemical industries, VCI):	10–13 (miscellaneous liquids and solids)
Disposal	According to GLP/institute requirements/regulations on the federal, national, and local level

Warning: The standard solution consists of **chemicals**. Accordingly, all **precautionary measures and regulations must be adhered to and applied**. (Do not swallow, do not taste, always wear gloves, etc.)

Container: Clear glass OPC ampoules.

Nominal volume: 1 ml

The ampoules have a break point (scored) on the neck and marked at the top by a blue dot. The ampoule can be opened manually by breaking it off at this point. Follow all safety precautions for the handling of glass (splintering, breakage, etc.).

12.3.2 Buffer and Stabilizing Solution

Information on safety and handling can be found in the attached safety data sheets.

60.9.0010 kit with:

37 x Acid buffer solution

Container: Screwed cover plastic bottles.

Nominal volume: 10 ml

1 x Stabilizer solution

Container: Screwed cover dropper bottle

Nominal volume: 30 ml



Please read the safety data sheets.

12.4 Storage and Shelf Life:

When stored unopened in their original containers at 5°C to 45°C, the consumables have a shelf life up to the expiration date indicated on the packaging.

Do not continue to use the consumables after the expiration date!

12.4.1 Standard Solution

Once the ampoule has been opened, the standard solution working life is up to ½ hour at + 22°C.

12.4.2 Acid Buffer and Stabilizer Solution (Working Solution)

The shelf life of fresh working solution (acid buffer with stabilizer solution) is a maximum of 14 days when kept in a sealed opaque vessel. Working solution (which contains silver chloride) that is to be used for measuring purposes should be used as soon as possible since it can react photochemically with light (reduction of the precipitated silver chloride into elementary silver). We recommend that a new working solution is prepared for each measurement series.

Appendix

12.5 Consumables

Item no.	Item	Packaging unit/qty
60.9.0010	Reagent set for chloride test Acid buffer solution (37x10 ml bottles) and stabilizer (1x30 ml bottle)	1
60.9.0100	Standard solution 100 mmol/l NaCl/H ₂ O; packaged in 10 ampoules each	1

12.6 Accessories and Replacement Parts

Item no.	Item	Packaging unit/qty
60.3.0010	Silver electrode (<i>anode</i> , red)	1
60.3.0020	Silver electrode (<i>cathode</i> , black)	1
60.3.0030	Measurement electrode	1
60.9.0001	Titration beaker (<i>special beaker</i>)	1
60.9.0002	Stir bar (magnetic)	1
60.9.0003	Magnetic stir bar retriever	1
60.9.0004	Cleaning kit for CM20 measurement electrode: Silver cleaning cloth and microfiber cleaning cloth	1
30.9.1010	Printer paper OSMOMAT 030-D/010/auto/CM20	8
30.9.1020	Ribbon cartridge for OSMOMAT 030-D/010/auto/CM20	1
20.9.0165	Data cable for RS232 interface for CM20	1
On request	Hand-held barcode scanner with power supply and cable	

Appendix

Classification of the IVD

The Chloride Meter made by us is a non-invasive in vitro diagnostic product according to EEC Directive 93/42 (Medical Devices Law). The Chloride Meter is not named in Annex II, list A or B, of the Directive 98/79/EEC for in-vitro diagnostics. Compliance is declared per Annex III. Number 6 of Annex II is disregarded, since the unit's intended use does not include personal use.

EC Conformity Statement—Chloride Meter

Gonotec GmbH
GSG-Hof Reuchlinstr. 10-11
D-10553 Berlin

We hereby declare that the chloride meter complies with Directive 98/79/EEC. Compliance is declared per Annex III of the Directive. The CE mark on the unit acknowledges this.

Date: 01.07.2009

Signature of managing director:

Provisions of Certification

CE compliance requires that the unit is installed and operated in the manner described in this manual. Any departure from the specifications or independent modifications of the unit without the express consent of Gonotec GmbH may result in a violation of CE requirements. Such actions invalidate the compliance statement and transfer responsibility to the originator of said actions.

Limited Warranty

Gonotec product	Duration of Limited Warranty
Software	90 days
Measurement electrode	180 days
Chloride Meter	1 year

A. Extension of the Limited Warranty

- Gonotec warrants the end user that Gonotec products shall be free from manufacturing and material defects for the above periods of validity from the date of purchase from the manufacturer.
- For software products, Gonotec's limited warranty applies only to the non-execution of programming instructions. Gonotec does not guarantee that the operation of a product will proceed without errors or interruptions.
- Gonotec's limited warranty applies only to defects that arise during normal operation of the product. It does not apply under the following conditions:
 - Inadequate servicing or improper modification;
 - Use of software, interfaces, print media or accessories not supported or supplied by Gonotec; or
 - Use of the equipment in a manner not covered by the product specifications.
- For the Gonotec Chloride Meter, the use of accessories—in particular measurement electrodes and titration electrodes—made by manufacturers other than Gonotec does not void the customer's warranty claims or any customer support contracts between Gonotec and the customer. If, however, such use results in malfunctions or damages to the Chloride Meter and the measurement and stirring equipment due to the use of titration beakers, measurement and titration electrodes by others, Gonotec shall assess the normal fees for the time and material required to repair the Chloride Meter in order to fix such malfunctions or damages.
- If Gonotec is notified within the warranty period of a defect in a software product, in media, measurement electrodes or titration electrodes and if the Gonotec warranty applies to the defect, Gonotec shall replace the defective product. If Gonotec is notified within the warranty period of a defect in a hardware product and if the Gonotec warranty applies to the defect, Gonotec shall repair or replace the defective product at its discretion.
- If Gonotec is unable to repair or replace a defective product to which the Gonotec warranty applies, Gonotec shall refund the purchase price of the product within a reasonable period following notification of the respective defect.
- Gonotec is not obligated to repair or replace a product or refund its purchase price until the customer returns the defective product to Gonotec.
- Replacement products may be new or almost new, as long as their functionality is at least that of the replaced product.
- The Gonotec limited warranty is applicable in all countries in which Gonotec sells the applicable product. The following countries and regions are exceptions: All countries outside the EU. In these countries, the warranty is only valid in the country in which the product was purchased. Contracts for additional warranty services, such as on-site service, may be available from an authorized Gonotec sales partner.

B. Limitation of the Warranty

- TO THE EXTENT PERMISSIBLE UNDER THE APPLICABLE LOCAL LAWS, NEITHER GONOTEC NOR ITS SUPPLIERS SHALL ASSUME ANY ADDITIONAL WARRANTY SERVICES OR ACCEPT ANY OTHER CONDITIONS, EXPRESS OR IMPLIED, WITH REGARD TO THE GONOTEC PRODUCTS.

C. Limitations of Liability

- To the extent permissible under the applicable local laws, the legal remedies named here shall be the sole and exclusive legal remedies available to the customer.
- TO THE EXTENT PERMISSIBLE UNDER THE APPLICABLE LOCAL LAWS AND WITH THE EXCEPTION OF THE OBLIGATIONS EXPRESSLY NAMED HERE, NEITHER GONOTEC NOR ITS SUPPLIERS SHALL BE LIABLE FOR DIRECT OR INDIRECT, SPECIFIC, INCIDENTAL OR CONSEQUENTIAL LOSSES, WHETHER BASED ON A CONTRACT, A TORTIOUS ACT OR ANOTHER LEGAL THEORY, AND NOTWITHSTANDING PRIOR NOTIFICATION OF THE POSSIBILITY OF SUCH A LOSS.

D. Respective Jurisdiction

- This warranty statement guarantees the customer certain legal claims. The customer may have other legal claims that go beyond those outlined here. Such claims vary by state in the US, by province in Canada and by nation elsewhere in the world.
- Elements of this warranty statement that conflict with local laws can be regarded as amended to comply with the applicable laws. For this reason, certain warranty exclusions and restrictions outlined here may be of no relevance to the customer. In some states of the US, in some Canadian provinces and in some countries outside North America, for example, the following national laws apply:
 - Exclusion of the fact that the warranty exclusions and restrictions named here restrict the legal rights of a customer (for example: Great Britain)
 - Restriction of the possibilities for manufacturers to enforce such warranty exclusions and restrictions
 - Granting of additional warranty claims for the customer, fixing of the validity period for implied warranty services that the manufacturer may not exclude, or non-admission of restrictions relating to the validity period for implied warranty services
- THE FOLLOWING APPLIES TO CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE CONDITIONS OF THIS WARRANTY STATEMENT NEITHER EXCLUDE LEGAL RIGHTS APPLICABLE TO THE SALE OF GONOTEC PRODUCTS TO SUCH CUSTOMERS NOR REPRESENT A RESTRICTION OR AMENDMENT OF SUCH RIGHTS, BUT INSTEAD REPRESENT A SUPPLEMENT TO THESE RIGHTS, EXCEPT TO THE EXTENT PERMISSIBLE UNDER THE LAW.

Returning Products for Warranty Repair or Credit

All products returned for repair or credit must be prepared as follows:

- 1 Call or write to request a free return order for equipment that is being returned for warranty repair or credit.
You may also request a return order for equipment that is being returned for non-warranty repair, but you will be liable for the cost of the return order.
- 2 Clean and disinfect the equipment before returning it to us. We will charge a processing fee for cleaning and disinfecting contaminated equipment. Equipment that is strongly contaminated will be returned at the customer's expense.
- 3 **Carefully push the protective shipping foam for the measurement equipment between the indentations for the measurement beaker and measurement equipment.**
- 4 Enclose written information explaining the reason for returning the equipment.
- 5 If the equipment is being returned for credit, you must include all accessories (power cord, software media, manuals, etc.).
- 6 Return the equipment in its original packaging. If you no longer have the original packaging, you may purchase replacement packaging from Gonotec.
- 7 Do you have a high sample volume and/or cannot afford downtime?
During the warranty time, we will provide you with a temporary unit at no cost.
Transport costs are only incurred outside the warranty period.

Before Calling Gonotec

Note: When calling Gonotec, have your unit's serial number ready. The serial number helps our service technicians to more quickly record the unit and determine a procedure.

If possible, switch on the unit before calling Gonotec's technical service. Use a telephone that is close to the unit. You may be asked to provide detailed information while running operations or apply other troubleshooting methods that can only be performed on the unit itself. Ensure that you have the equipment documentation handy.



Warning: Before undertaking any work on the equipment, read the safety notices in the appropriate chapters of this manual.

Tel.: +49 (030) 7809588-0
toll-free (Germany only!):
0800-7846027

Specifications

■ Overview

(Standard model)

Sample volume:	20 µl
Ready for operation:	Immediately after switching on and from standby
Duration of measurement:	Approx. 20 sec.
Reproducibility:	±2 digits (20 µl) at 100 mmol/l
Measurement display:	0–999 mmol/l
Measuring range:	10–999 mmol/l
Resolution:	1 mmol/l over the entire measurement range
Integrated stirrer:	Magnetic stir bar PTFE, cylindrical
Interfaces	2 × RS232 (one RS232 reserved for barcode reader); 1 × USB
Storage temperature:	-40°C to 70°C / -40°F to 158°F
Room humidity:	5–80% (non-condensing)
Altitude (operating):	up to 2000 m
Power connection:	100–120 VAC / 200–240 VAC
Frequency:	50–60 Hz
Power:	20 VA
Power cable:	Detachable power supply cable
Fuses (2): (HBC breaking capacity 1500 A)	1.0 A for 200–240 VAC 1.0 A for 100-120 VAC
Memory backup:	Integral lithium cell: 10 years useful life
Overvoltage category:	I
Degree of pollution:	2
Protection rating:	IP21
Dimensions (WDH):	205 x 220 x 360 mm 8 x 8.7 x 14.2 inches
Weight (net):	5.7 kg / 12.54 lbs.

(Option)

Printer (Option D):	Alphanumeric dot matrix printer, 5x7 matrix, date, time and sample information on each measurement
Number of digits:	≥16 characters per row
Paper:	Normal paper, 43 mm wide
Printer function:	various print modes: single print, batch printing printed in plain text
Error message:	

Manufacturer:

Gonotec GmbH
GSG-Hof Reuchlinstr. 10-11
D-10553 Berlin
GERMANY

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