COMPACT LABORATORY MIXERS

MODEL CLM4 MODEL CLM6

User manual Version 1.0

MCR PROCÉDÉS & TECHNOLOGIES

Dear Customer,

Thank you for purchasing a CLM model jar tester. We want to make sure that you received the instrument in good order and that you do not have any problems with the initial operation.

After many years of process follow-up and troubleshooting in collaboration with wastewater treatment plant operators, *MCR Process & Technology* has developed new tools to assist operators in their daily tasks. The CLM is one of these tools and was designed to meet a need for laboratory jar tests.

We hope you will be pleased with the operation and performance of your new instrument. If you have any problems related to the operation or questions about the instrument, call us at 1-418-650-9154.

Sincerely,

Alain Durocher, Eng.
President

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1 INTRODUCTION

The jar test is an old water treatment test procedure, first introduced in the 1930s. It has remained essentially unchanged since then, although there have been various refinements such as increased mixing speeds and the use of square jars instead of cylindrical beakers.

As basic as the jar test may be, it remains one of the best methods of assessing and optimizing the various processes and options available for treatment of potable and other types of water and wastewater.

Properly done, it can provide a great deal of information during all phases of a treatment system's development - initial process screening and development, equipment sizing, operational optimization, troubleshooting, settling aids evaluation on secondary clarifier and evaluation of potential alternative treatment processes. All this can be achieved at relatively little cost, and without the need for a great deal of high-tech knowledge and expertise.

However, unlike most analytical procedures used in the water and wastewater supply industry, there is no standardization of jar testing procedures and the results are almost always open to different interpretations and conclusions. Therefore, a great deal of thought and care, as well as more than a little experience, is essential if the jar test procedure is to achieve its full potential.

Equipment for conducting jar tests has been available for a long time. MCR offers several jar testing systems, each intended for a different purpose. The CLM models offers several significant improvements in the area of small size, light weight, portability and ease of operation.

It is not the intent of this manual to discuss in detail all the various planning, objectives, calculations, procedures, and other considerations that are involved in conducting a jar test; this information is available from many different sources. Rather, the intent is to describe the aspects of the procedures that are specific to the CLM models. Four and six station CLM units are available. The only difference between them is the number of stations – all other features and functions are identical.

2 SHIPPING INSPECTION

On delivery, inspect the contents to ensure that no damage occurred during shipment. If damage is present, save the shipping box in case a damage claim is necessary. Any damage in shipment should be reported immediately to MCR.

2.1 Packing list

The items listed below should be included in the CLM shipping carton. Please check that all items are present and undamaged, and contact MCR if there is a problem.

1. CLM mixer unit (4 or 6 station) with control panel and illumination base.
2. 1 Litre sample container (jar) – 4 or 6 depending on model.
3. Baffle / dosing module (4 or 6 station).
4. White and black background curtain.
5. For each jar: 1-3-5-10 mL syringes.
6. Plug-in universal power supply (wall transformer) with power cord.
7. Double-wall box with 2 end cap foam inserts.
8. Sampling ports (optional): For each jar: 50 mL beaker, threaded adapter, stopcock, cap, tubing adapter, tubing.
9. Carrying case (optional).
10. Other options if purchased.

2.2 Shipping tape

To prevent the possibility of parts becoming separated, moving around in the carrying case, and damaging each other, the CLM is shipped with the main mixer assembly and the jar module taped together. Remove this tape after unpacking for the first time.

For transportation in your vehicle the entire CLM system can (after unpacking) be stored and transported fully assembled, with jars and baffle module in place, in the double-wall shipping carton with foam inserts (or optional carrying case). The equipment will be well enough protected if it is handled with reasonable care. However, it would probably be wise to consider re-taping the main parts if the CLM is to be shipped by a commercial courier. For transportation in the cargo space of an aircraft we recommend the use of a more robust case designed for this purpose.

2.3 Protective sheet over the LCD screen

The LCD screen (main control panel) is protected with a transparent sheet to avoid scratches during transportation. Remove the protective sheet after unpacking for the first time.

2.4 Serial number

Each CLM has a unique four-digit serial number. This can be found on the back of the mixer unit, near the power jack.

3 DO'S AND DON'TS

3.1 Do's

- Please read the entire manual before attempting to unpack, set up, or operate the equipment and pay attention to all the warnings, cautions and notes. Failure to do so may result in injury to the operator or damage to the equipment.
- The CLM is laboratory equipment and should be used as such:
    - Handle the equipment with care.
    - Always use this equipment indoors and preferably in a non-humid, dust-free, non-corrosive environment.
- The jar support platform (illuminated diffuser) is sealed to the base unit and can accept spillage from the jars. From time to time, check that the diffuser is not cracked or damaged, and that there is no visible leakage of water through the joint between the diffuser and the base.
- Remove power before any manipulation of the apparatus or cleaning operation.
- The CLM is designed to operate from a 12 volts DC power source. The system is supplied with a plug-in power supply unit which provides 12V DC from any AC electrical outlet. If an alternative power source is used, be sure that the mixer unit receives only 12V DC, with positive to the center pin of the jack.
- Use only non-abrasive cleaners for plastics.
- If the optional carrying case has been purchased, the unit should be placed in its carrying case so that it is upright (not upside down) when being carried by the handle in the normal way. This means that the top of the unit should be nearest the handle (bottom towards the case hinge). There are two reasons for this. One is to minimize the likelihood of the jars bouncing around, striking the mixing bar, and possibly doing some damage. The other is to ensure that the front panel control knob fit into the recessed provided in the foam lining and is not damaged.
- Stopcocks must be removed from the jars before closing the lid of the carrying case. This takes only a few seconds. If the stopcocks are not removed, they could easily be damaged by closing the lid on them.
- Initial verification. Check the following items:
    - Water tightness of the acrylic jar;
    - The light from the illumination base comes on;
    - Motor operates and paddles move correctly.

3.2 Don'ts

- Do not attempt to use the equipment with any other power source other that indicated on the rear label;
- The CLM system operates on low voltage DC power and is therefore safe electrically. Also, the unit has been designed to be reasonably drip and splash resistant, but it is not waterproof. Consequently, do not submerge this equipment and take reasonable care to prevent water entering the ventilation openings on the back of the unit, or around the right-side end cover. If water does enter, immediately disconnect the equipment from the power supply. Leave the equipment to drain and dry out completely, then have it checked by a qualified electrician before using again.
- Do not rinse or clean the equipment with water over 35°C. Hot water may cause damage to the acrylic and graduated scales finish and can loosen the joints.
- Do not hold the paddles while they are turning, or in any other way try to stop them from rotating. Do not try to rotate the paddles by hand. This could cause injury or damage the drive mechanism.

Warning

- Even if the CLM has a high torque motor there is always a limit. The CLM system is designed to run jar test with samples having a water-like consistency (raw potable water, wastewater, mixed liquor, sludge to dewatering system at maximum 3% consistency, polymer solution to maximum 0,5% solids). **If your application differs, please contact us to see if you can use the CLM; otherwise the warranty will not apply.**
- Do not attempt to operate it with highly viscous liquids (like crude oil, molasses, high viscosity polymers, etc.) or very thick sludge. Doing so could overload and damage the drive system.
- Note that the paddle shafts have some free play in their sleeves, and the paddles may therefore “wobble” slightly. The clearance between the paddle shaft and sleeve is deliberate and is carefully controlled to ensure that there is no binding of the shaft. It does not indicate a problem with the CLM unit.

4 PART IDENTIFICATION AND EQUIPMENT DESCRIPTION

4.1 Part identification

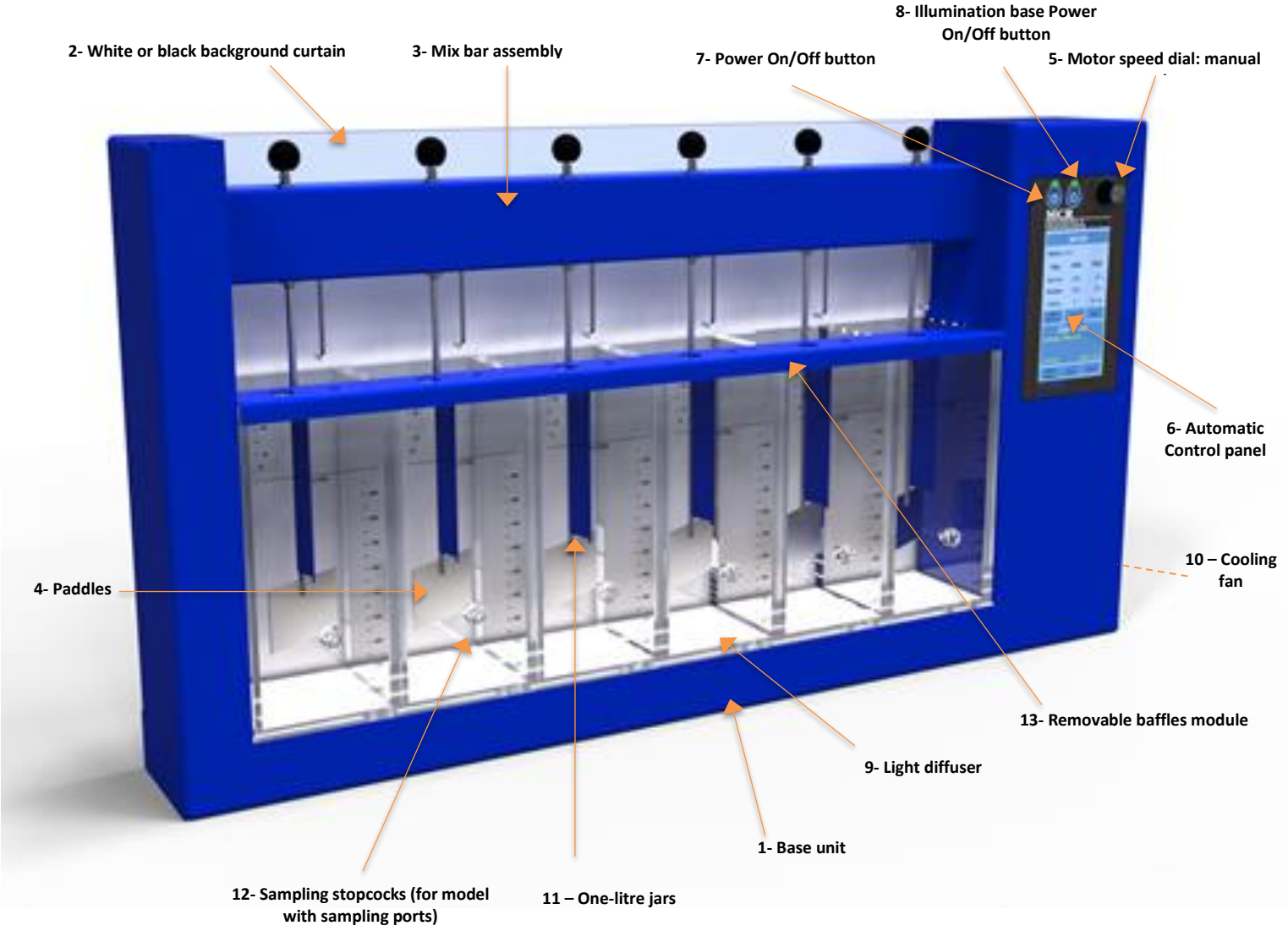


Figure 4.1 : CLM Main Components

The illustration shows the main features of the CLM systems. The six-jar CLM6 Is shown; except for the number of stations, the four-jar CLM4 is identical.

The base unit (1) includes jar support base, mixer drive system, paddles, light, and controls. A solid black or white vertical surface (2) behind the jars provides a uniform background for observations of samples. The white curtain sheet is used for work with color removal and similar processes.

The mix bar assembly (3) is part of the base unit. Paddles (4) can be lifted and parked, or lowered for service, in a single, one-hand operation.

Mixer speed can be adjusted manually with a knob (5) or in automatic via the LCD control panel (6). In both cases speed is always indicated on the LCD screen. The control panel is powered on by an ON/OFF button (7) over the membrane. High intensity LEDs in the illumination base (9) are switched on or off by a second power button (8) near the top of the panel.

A built-in cooling fan (10) reduces the possibility of misleading results caused by sample heating.

One-litre square sample jars (11) with graduated marks are used, with optional subsurface sampling by means of a quick-connect stopcock system (12).

The CLM system uses a removable baffle module (13) with dosing syringe holes. The baffles prevent vortexing and air entrainment at high mixing intensities.

4.2 EQUIPMENT DESCRIPTION

The CLM is constructed from the same high-quality materials used in our other systems - epoxy coated aluminum housings, stainless steel paddles and shafts, hardened steel helical gears, lubricated oil-impregnated bronze bearings, and clear acrylic jar assemblies.

4.2.1 Main components

Figure 4.1 shows the main features of the CLM system. It consists of six main components:

1. Base unit.
2. Sample jars (sampling ports optional).
3. Control panel and power supply.
4. Illumination base.
5. Baffle/dosing module.
6. Shipping carton.

4.2.2 Base unit

The mixer unit consists of two main parts:

Main housing
This enclosure contains:

1. Mixer drive motor.
2. Coupling to the paddle drive shaft.
3. Speed control circuit board.
4. Power on/off switch.

5. Illumination base power on/off switch.
6. DEL lighting system.
7. Cooling fan.
8. Manual speed adjustment control.
9. Black and white backplates.

The housing also has a power jack on the rear (for connection to a 12V DC power source). Access to the inside of the housing is by removing the screws holding the end panel on the right side of the housing.

Mixbar assembly

The basic structure consists of an aluminum housing with rear cover plate. It contains bearings for the main drive shaft and each of the paddle shafts. The shafts are coupled to the main drive shaft by helical gears.

4.2.3 Sample jars

The CLM uses one-litre sample containers (jars), supplied as standard equipment with the unit. Additional jars or fittings are obtainable separately.

The jar is constructed from clear acrylic sheet with graduation marks at each 50 mL level.

Sets of 4 dosing syringes (1-3-5 and 10 mL) are provided.

Sampling port (optional)

Each jar is usually supplied with the threaded adapters already in the sample ports on the front of the jar assembly. If not, insert them and tighten snugly (do not overtighten). These adapters are normally left permanently in position.

For subsurface sampling (mostly for potable water), each jar is supplied (optional) with:

1. Sampling stopcock which attaches to the threaded adapter.
2. Flexible sampling tube with connector.
3. 50 mL beaker.
4. Cap that can be used in place of the stopcock when subsurface sampling is not required.

4.2.4 Control panel

The CLM can be powered from any 12V DC supply, through a standard power jack on the rear of the unit. The input power jack is designed to accept a plug with a 2.1 mm inside diameter, 5.5 mm outside diameter, and 12 mm barrel length.

Normally, this power would be provided by the 12V DC plug-in wall transformer supplied with the system. This transformer is designed to operate with input AC power from 100 to 240 volts, 50 to 60 Hz.

It comes with a Qualtek or equivalent power cord selected during ordering to suit your outlet configuration (North America, Americas, Africa, Europe, UK, Australia). Most countries use one of these standard configurations, so the CLM power supply can be used directly in nearly every country in the world without the need for adapters of any kind.

For those countries with different electrical outlet configurations, it will be necessary for the user to supply either a plug style adapter (see Adaptelec website for help), or a different transformer to suit local conditions. These are easily available nearly everywhere, at very low cost. Any new transformer to be used should have an output of 12 volts DC (unregulated) at 5.4 amps (a higher current rating would be OK but is not necessary). Be sure that the output plug has the center pin positive.

Controls for the CLM are simple:

- Power on/off switch on front of the panel with a green light when on.
- Illumination base power on/off switch on front of the panel with a green light when on.
- Manual mixer speed adjustment control.
- LCD panel with automatic control of the entire sequence (see complete details in Section 5):
    - Jar test sequence (flash mix, flocculation and settling).
    - Polymer preparation sequence (Dissolving and aging).
    - Sequences are programmable and can be stored.
    - For each step, motor rpm and time can be adjusted.
    - 3 languages available: English, Spanish and French.

4.2.5 Illumination base

Proper illumination is essential for visual observation of each test step of the samples being tested. The CLM system incorporates a high-efficiency LED system for illumination of the base and samples. The illumination can be turned on or off as desired.

The LED strip lights have a rated life of at least 50000 hours, equivalent to over 135 years' operation at an hour each day.

4.2.6 Baffle / dosing module

The baffle/dosing module serves two functions. The first is to provide baffling in the jars, to reduce vortexing and air entrainment at high mixer speeds. The second is to provide a holder for chemical dosing syringes, so that chemicals can be added simultaneously and accurately to all jars.

The module is designed to use standard 1 mL and 5 ml syringes for chemical dosing. It can hold one syringe of each size for each station. The syringes are filled with the appropriate amounts of each chemical to be dosed and inserted into the module. The baffle/dosing module can be removed from the base unit after the mixer speed has been reduced to less than 200 rpm, or chemical dosing has been completed.

When not in use, the baffle/dosing module can be conveniently stored along the top of the back plate of the base unit, with the baffles hanging down behind the backplate. In this position, the module is always conveniently available, and does not take up any significant space or interfere in any way with operation.

4.2.7 Shipping carton

To minimize the chances of damage during shipment, the CLM system is packed in a double-wall carton. The base unit is carried between two special foam inserts. This shipping carton should be kept as it can be used as carrying box.

For transportation in your vehicle the entire CLM system can (after unpacking) be stored and transported fully assembled, with jars and baffle module in place, in the double-wall shipping carton with foam inserts (or optional carrying case). The equipment will be well enough protected if it is handled with reasonable care. However, it would probably be wise to consider re-taping the main parts if the CLM is to be shipped by a commercial courier. For transportation in the cargo space of an aircraft we recommend the use of a more robust case and designed for this purpose.

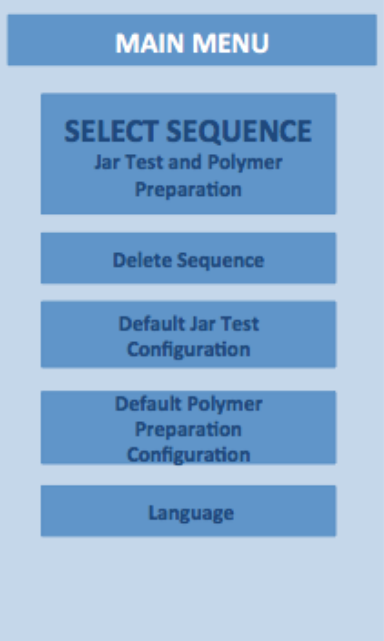
Optional carrying case

As initially supplied, the foam inserts are configured to snugly fit the CLM base unit, jars, and power supply with space left over for the other accessories (dosing syringes, sample containers, tubes). We recommend carrying chemicals separately to avoid the possibility of spills damaging the equipment. When returning the CLM unit to the carrying case, be sure that it is oriented so that the unit is upright when being carried (top of the CLM towards the handle of the case).

5 CLM CONTROL PANEL OPERATION

5.1 Start Up

5.1.1 Powering the instrument

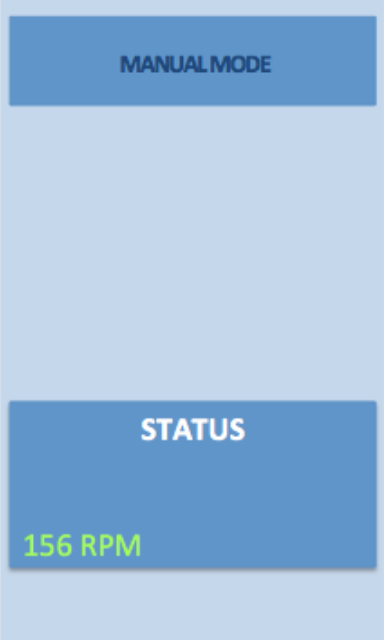


1. Plug the external power supply into an electrical outlet.
2. Press the On/Off switch for approximately one second to power on the instrument.
3. Press the On/Off Switch for 3 to 5 seconds to turn the instruments off.
4. When the instrument is turned ON, the **MAIN MENU** appears.

5.1.2 Choosing the operating Mode

The CLM comes with two separate modes of operation: **Manual mode** or **Programmable mode**.

5.1.3 Manual mode

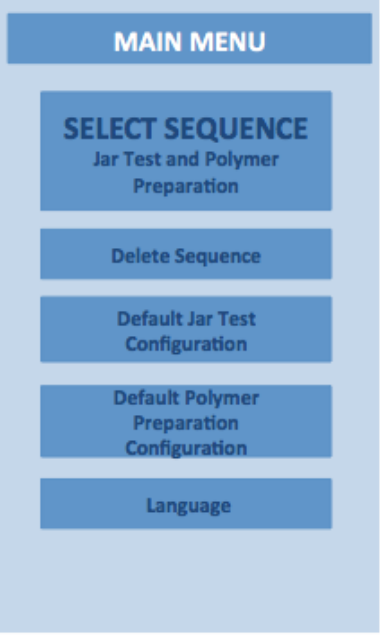


Manual mode allows manual operation of the mixing, regardless of the programmed sequence (flash mix, flocculation and settling). The user controls the speed and time desired for each step of the test.

To enter **Manual mode,** turn the **Motor Speed Dial** button clockwise to increase the motor speed. Motor RPM is indicated on the screen.

In manual mode, access to the **Programmable mode** is not possible. To change to **Programmable mode**, turn the speed control knob fully counter-clockwise to stop the motor rotation. The CLM will then be in **Programmable mode**.

5.1.4 Programmable mode



In **Programmable mode** the following actions are available from the **Main menu**:

- Select a Jar test or a Polymer preparation sequence;
- Delete a sequence;
- Change the basic settings of a Jar Test or Preparation polymer sequence;
- Choose language.

5.2 Standard Operations in programmable mode

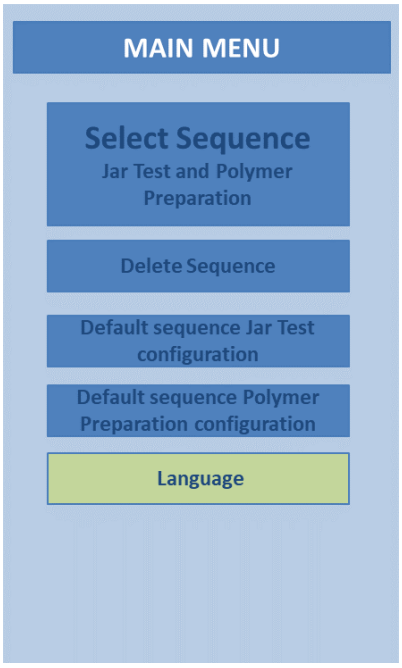
5.2.1 Getting started

5.2.1.1 Tips for using the touch screen

The whole screen responds to touch. To choose an option, tap with a fingernail, fingertip, an eraser or a specialized stylus. Do not touch the screen with sharp objects, such as the tip of a ballpoint pen.

- Press buttons, words or icons to select them.

5.2.1.2 Language selection

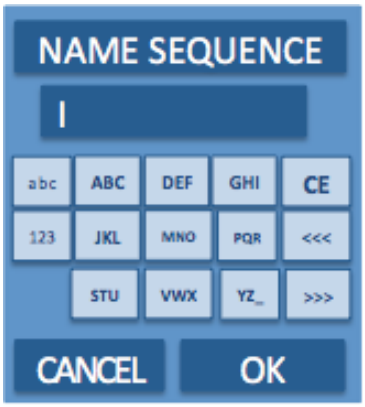


The CLM software includes three language options.

1. Select **Language** in the **Main menu.** The languages available will appear.
2. Chose the desired language.
3. The instrument will then return to the **Main menu** in the selected language.

Once the language is selected, the instrument will power up in that language until a different language is selected.

5.2.1.3 Use of the alphanumeric keypad



This display is used to enter letters, numbers and symbols as needed when programming the instrument. Unavailable options are disabled (greyed out). The icons on the right and left of the screen are described in Table 5.1.

The central keypad changes to reflect the chosen entry mode. Press a key repeatedly until the desired character appears on the screen. Using the underscore on the YZ_ key can enter a space.

Press **Cancel** to cancel an entry, or press **OK** to confirm an entry.

Table 5.1 : Alphanumeric keypad

Icon / key	Description	Function
ABC/abc	Alphabetic	Toggles the character input mode between upper and lower case.
123	Numeric	For entering regular numbers.
CE	Clear Entry	Clear the entry.
<<<	Back	Deletes the current character and goes back one position.
>>>	Next	Navigates to the next space in an entry.

As an example, say you want to assign a sequence name "Quebec 01":

- To type the letter Q press 

twice.
- To change to lowercase letters, press 

.
- Continue entering the name with lowercase letters. To enter “u”, press 

3 times (to select the “u”), and so on for the other letters.
- To enter numbers, press 

. The keyboard will indicate numeric characters. Enter the desired numbers. To return to the alphanumeric keypad, press 

.

5.2.2 Instrument setup mode

The CLM default settings can be changed as desired.

5.2.2.1 Setting the default Jar Test configuration

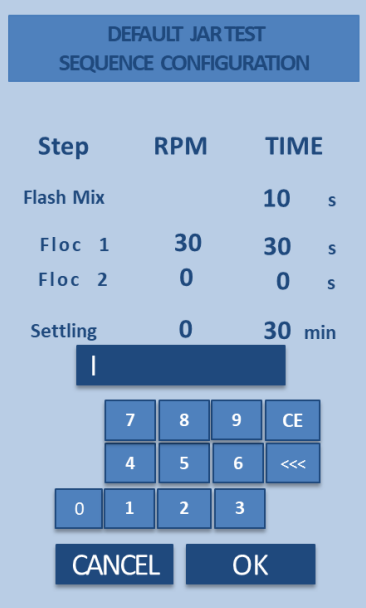
1. Select **Default sequence Jar Test Configuration** in the **Main menu**.
2. The indicated screen will appear.
3. Use the alphanumeric keypad to enter for each **Step** – Flash mix, flocculation 1 and 2 and settling - the **RPM** and the **TIME** as desired number.
4. When finished, press **OK**.

The maximum available RPM is 300. If you try to select more than 300 RPM, the following message will appear:

MAXIMUM RPM IS 300

The minimum RPM is 30. If you try to select less than 30 RPM, the following message will appear:

MINIMUM RPM IS 30



5. To save the new parameters press **Save**.
6. **SAVED values** will appear on the screen.

*Then, all sequences name as **Default**, will be re-initialized based on the new desired configuration setting.*

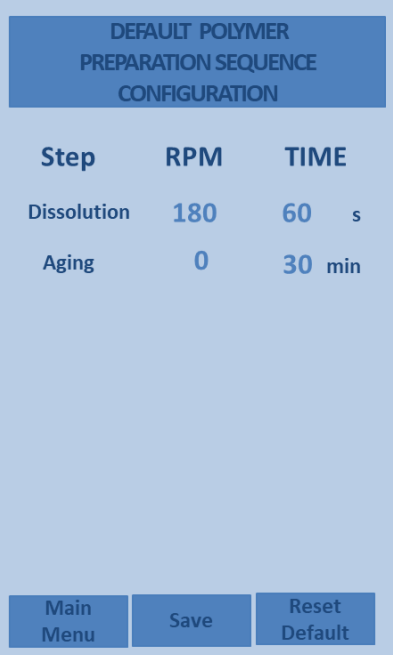
Once this configuration is done, the instrument will power up with the new data until a different configuration is entered.

7. To restore the default parameters, press the **Reset Default** button.
8. **RESTORING TO DEFAULT** will appear on the screen.

For each step, the default parameters are:

Flash Mix:	***300 RPM***	***10 s.***
Floc 1:	***30 RPM***	***30 s.***
Floc 2:	***0 RPM***	***0 s.***
Settling:	***0 RPM***	***30 min.***

5.2.2.2 Setting the default Polymer preparation configuration



1. Select **Default Polymer preparation sequence configuration** in the **Main menu**.
2. The indicated screen will appear.
3. Use the alphanumeric keypad to enter for each **Step** – Dissolution and Aging - the **RPM** and **TIME** desired.
4. Press **OK**.
5. To save the new parameters press **Save**.
6. **SAVED values** will appear on the screen.

Once this configuration is done, the instrument will power up with the new data until a different configuration is entered.

7. To restore the default parameters, press the **Reset Default** button.
8. **RESTORING TO DEFAULT** will appear on the screen.

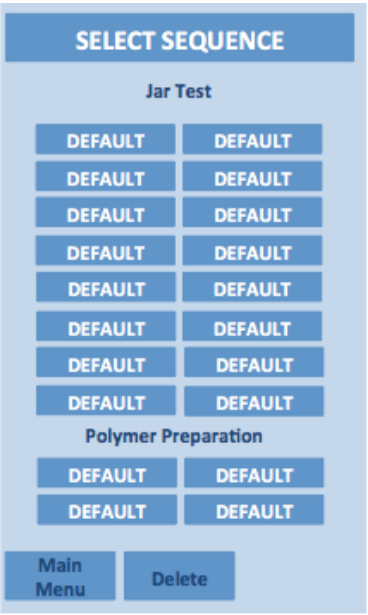
For each step, the default parameters are:

Dissolution: 180 RPM 60 s.
Aging: 0 RPM 30 min.

5.2.3 Running a Jar Test

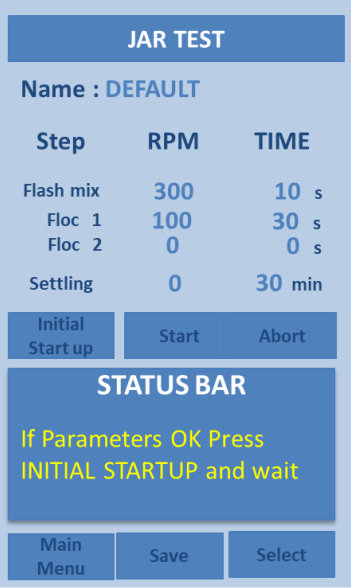
Sixteen stored jar test sequences are available. These can be accessed though the **Select Sequence** screen from the **Main menu**.

5.2.3.1 Selecting a Stored Jar Test Sequence



1. From the **Main Menu**, press **Select Sequence – Jar Test and Polymer preparation** to view a list of the programmable sequences.
2. Select the desired sequence by pressing the appropriate button.

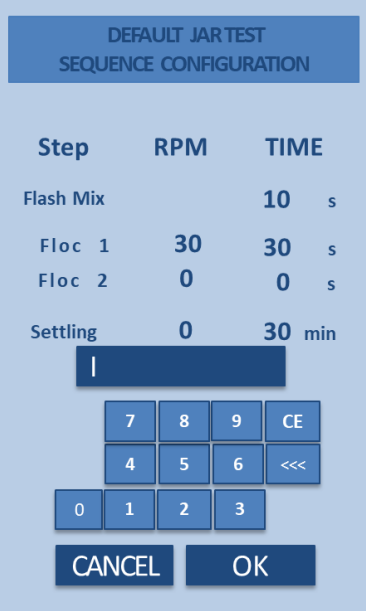
*Buttons containing registration **Default**, etc. contain the basic parameters of the system.*



*From the detailed window for a sequence, a new sequence can be selected, by pressing **Select**. Before doing this, a running sequence must be ended, by pressing **Abort**.*

5.2.3.2 Running a jar test sequence

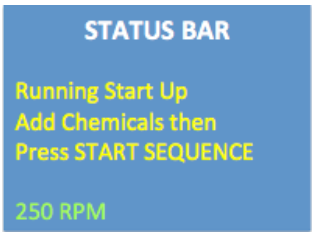
1. The selected sequence appears as shown.
2. Status Bar shows: **If parameters OK**
3. If yes, **Press INITIAL START UP and wait**
4. Otherwise, modify the parameters as indicated below.



5. Each step of a sequence can be easily changed. For example, to change the RPM of Flash mix from 300 RPM to 250 RPM, touch the RPM number and a window will open with alphanumeric keys to change it.
6. Enter the desired value and press **OK**.

The first time a parameter is changed from a default one, the CLM will ask to save it as a new sequence (see section 5.2.4). To not save it, press CANCEL, otherwise refer to section 5.2.4.

7. Once all the parameters have been set, start the sequence by pressing **Initial Start Up**.
8. The Status Bar then shows the progression of the speed in RPM
9. When the speed reaches the specified RPM for the Flash mix, the Status bar displays

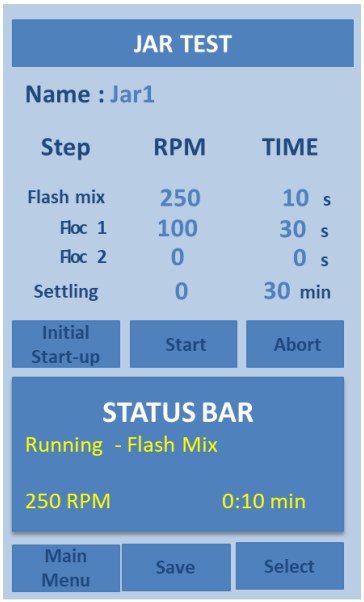


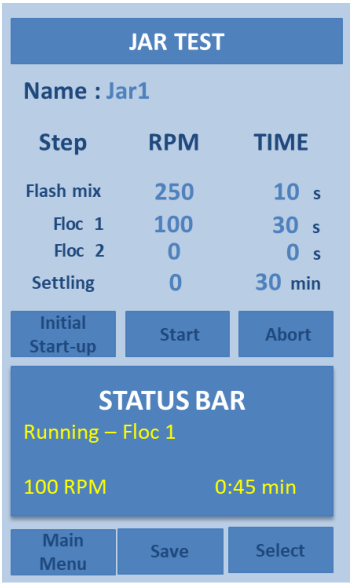
This indicates that the device is ready to begin the sequence.

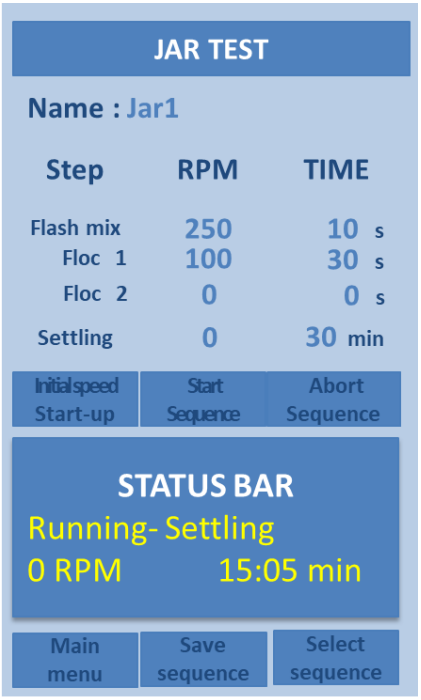
10. Add desired chemicals to each jar as quickly as possible.
11. Press **Start** to start the sequence.

12. The STATUS BAR indicates progress of each step (flash mix, flocculation, settling) with the RPM and time.

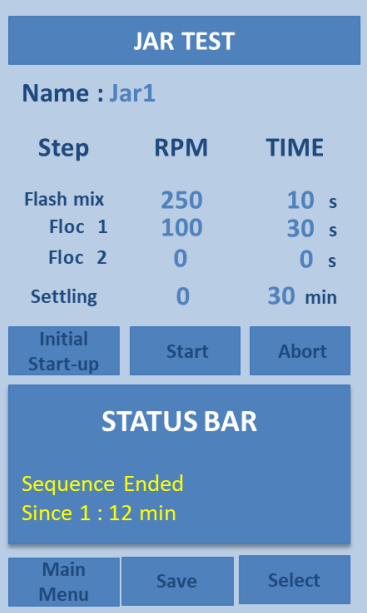
A beep indicates completion of one step and the start of the next.



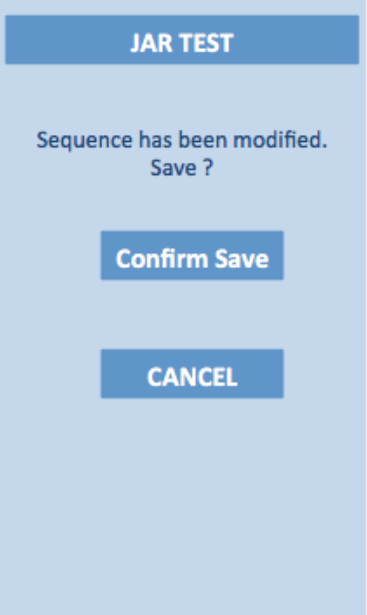




13. During the settling step. a beep will sound every 5 minutes.
14. Three beeps indicate completion of the sequence.



15. The Status Bar will then show "Sequence ended". The RPM and the timer indicate zero.
16. A timer on the screen indicates when the sequence was completed.



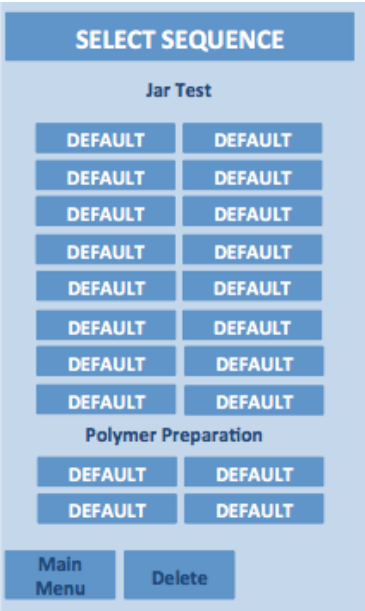
17. If a test value has been changed since the last **Save sequence**, a window asks for a confirmation before saving.
18. After pressing **Confirm Save**, **SAVING** will appear on the screen.
19. TO exit without saving, press **CANCEL**.

*While a sequence is running, the only button that is active is the **Abort** button. This interrupts the current running sequence.*

5.2.4 Running a polymer preparation

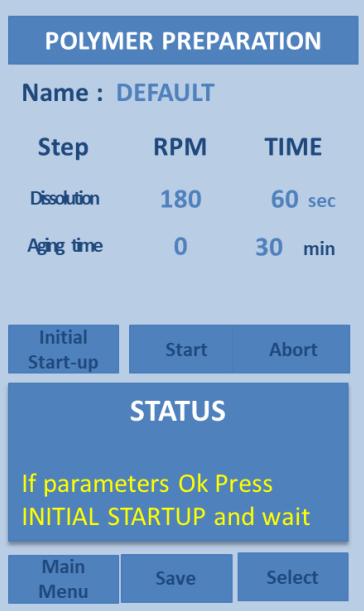
The CLM allows four programmable polymer preparation sequences, accessible though the **Select Sequence** menu.

5.2.4.1 Selecting a Stored Polymer preparation Sequence



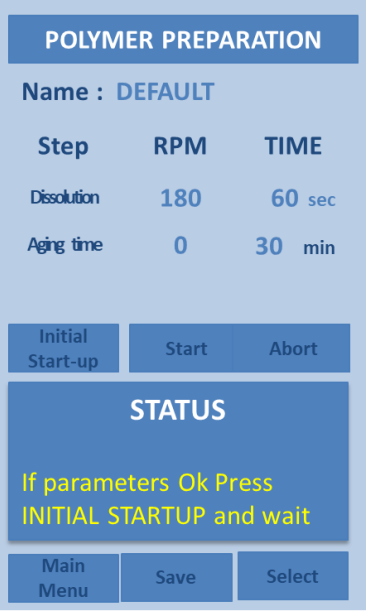
1. From the **Main Menu**, press **Select Sequence – Jar Test and Polymer preparation** to view a list of the programmable sequences.
2. Select the desired sequence by pressing the appropriate button.

*Buttons **DEFAULT** indicate the basic parameters of the sequences.*

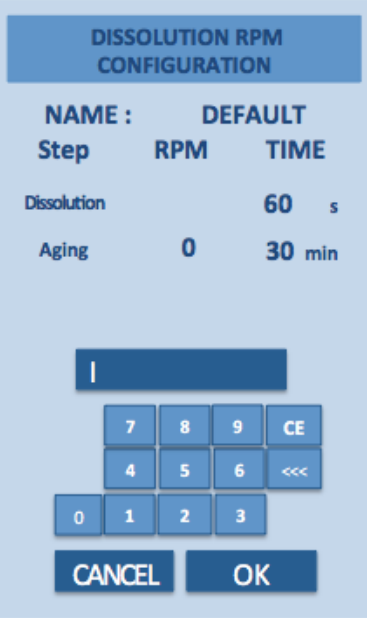


*From the window of a running sequence a new sequence can be selected by pressing **Select**. Before doing this, a running sequence must be ended by pressing **Abort**.*

5.2.4.2 Running a polymer preparation sequence



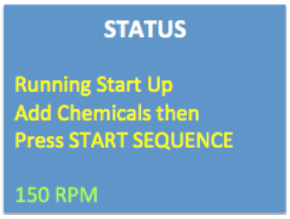
1. The selected sequence appears as shown.
2. Status Bar show: **If parameters OK Press INITIAL START UP and wait**.



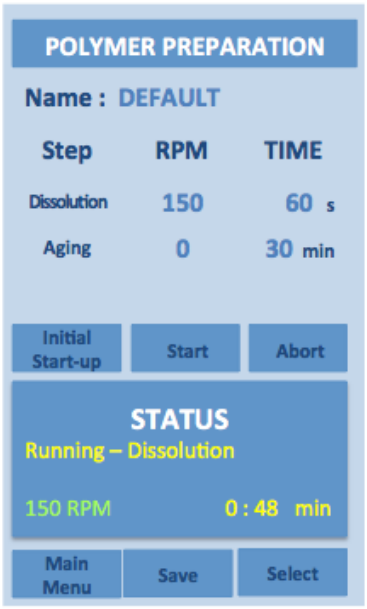
3. Each step of a sequence can be easily changed. For example, to change the RPM of Dissolution from 180 RPM to 150 RPM, touch the RPM number and a window will open with alphanumeric keys to change it.
4. Enter the desired value and press **OK**.

The first time a parameter is change from a default one, the CLM will ask to save it as a new sequence (see section 5.2.5). To not save it, press CANCEL, otherwise refer to section 5.2.5.

5. Once all the parameters have been set, start the sequence by pressing **Initial Start Up.**
6. The Status Bar then shows the progression of the speed in RPM
7. When the speed reaches the specified RPM for the Flash mix, the Status bar displays

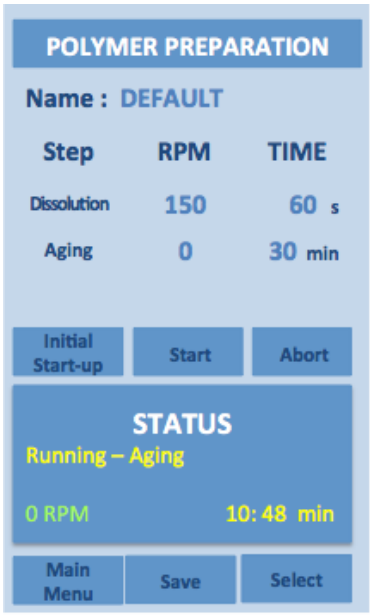


This indicates that the device is ready to begin the sequence.

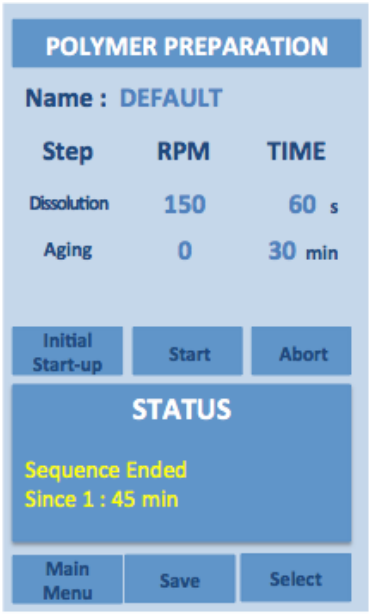


8. Add chemicals to each jar.
9. Press **Start** to start the sequence.
10. Status bar indicates progress of each step (dissolution, aging) with the RPM and time.

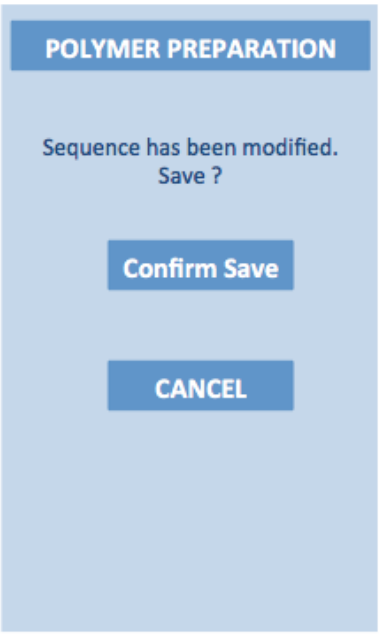
A beeping sound indicates completion of one step and start of the next.



11. Three beeps indicate completion of the sequence.



12. The Status Bar will then show "**Sequence ended.**" The RPM and the timer indicate zero.
13. A timer on the screen indicates since when the sequence was completed.



14. If a test value has been changed since the last **Save sequence**, a window asks for confirmation before saving.
15. After pressing **Confirm Save**, **SAVING** will appear on the screen.
16. To exit without saving, press **CANCEL**.

*While a sequence is running, the only button that is active is the **Abort** button. This interrupts the current running sequence.*

5.2.5 Saving a sequence

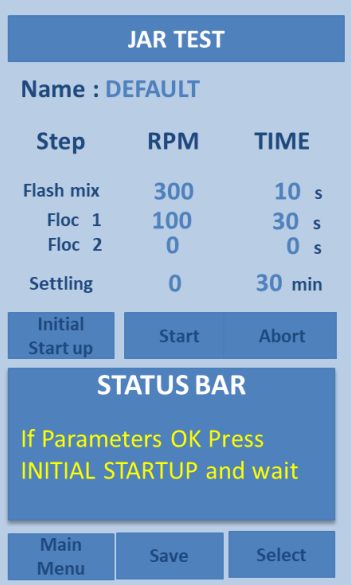
To save the sequence that just ended:

1. Press **Save.** The indicated screen will appear.

This window will also appear each time that the CLM asks to save a sequence just being modified.

2. Using the alphanumeric key enter the name of the sequence as described in section 5.2.1.3,
3. Press **OK**. The name will appear in the top of the sequence.

5.2.6 Aborting a sequence



To interrupt a running sequence,

1. Press **Abort.** The indicated screen will appear and the sequence will stop.

The CLM is then ready to restart the sequence. The system retains the previous settings. For example, if a flash mix of 250 RPM for 10 secs was set instead of a basic setting at 300 RPM for 3 seconds, it will be maintained. If a previously modified sequence is selected, that will then be retained.

5.2.7 Back to main menu

The **Main menu** can be recalled at any time by pressing **Main Menu**.

6 JAR TEST PROCEDURE

6.1 General

The basic objective of the jar testing procedure is to simulate, as far as is practical, the processes that are being, or might be, used in a full-scale treatment plant. Because there are fundamental differences between batch and continuous flow processes, the jar test does have its limitations. Nevertheless, it can prove very useful as a simple, rapid, and economical means of evaluating how well proposed water treatment processes can be expected to work, and in determining certain process parameters such as chemical dosages and reaction times.

Of course, each situation will be unique, with its own circumstances and objectives. Therefore, only a simplified, general test procedure can be given; this must be modified as required by the specific situation.

6.2 Material

- CLM and accessories.
- Bucket.
- Paddle.
- Thermometer.

6.3 Reagents

- Reagents to test.

6.4 Sampling and storage

6.4.1 Sampling

- Take a grab or composite sample. Be sure that the sample will be taken in zone where it will be representative of the process you want to simulate.

6.4.2 Storage

- The test should be done as soon as possible after sampling.
- No storage possible without affecting the results.

6.5 Suggested basic jar test procedure

1. Sample water or the liquid to be subjected to the test.
2. Turning on the illumination base of the unit will greatly improve observation of floc formation and other processes taking place. Because the built-in cooling fan prevents excessive heating of the diffuser base and sample jars, the illumination base may be left on throughout a jar test run if desired.
3. In most cases, a black background will be best for observing particles in water contained in the jars. However, for some processes (such as color removal) a white background will be more appropriate. In these cases, simply place the white plastic curtain in front.
4. Fill the jars to the 1000 mL mark with the water being tested.
5. Raise the paddles, place the jars in position on the base, and lower the paddles into the jars.
6. For operation at full mixer speed, the baffle/dosing module should be used; otherwise, the contents of the jars may be subject to excessive vortexing and air entrainment.
7. Place the baffle/dosing module along the tops of the jars, with the front flange clipped over the jars. This ensures that the baffles are held snugly against the front of the jars
8. For each of the test stations being used, fill syringes with the appropriate amount of stock chemical (such as alum coagulant and/or polymer) and insert these into the holes of the baffle/dosing module.
9. Start the automatic sequence as presented in Chapter 5, or use the manual mode.
10. For the automatic sequence (see Chapter 5)
    a. Choose:
        i. Motor speed and duration of Flash mix
        ii. Motor speed and duration of the flocculation 1 and flocculation 2
        iii. Settling time
    b. Start the sequence
    c. Inject the chemicals into the jars.
        i. It should be easily possible to dose all jars within one or two seconds of each other. Inject chemicals
    d. Let the sequence unfold automatically.
11. For the manual mode sequence
    a. Choose:
        i. Motor speed and duration of Flash mix
        ii. Motor speed and duration of the flocculation
        iii. Settling time
    b. Start the mixer motor and set it to the desired speed on the control panel dial; usually 300 rpm for the flash mix stage.
        i. Note: For simulation of the short, high-intensity “flash mixing” often used in coagulant addition, the mixer speed should be reduced after a time corresponding as closely as possible to the actual mixing time that would be used in a full-scale plant. In many cases, this would be almost immediately after coagulant addition.
    c. Inject the chemicals into the jars.
        i. It should be easily possible to dose all jars within one or two seconds of each other.
    d. The baffle/dosing module can be removed, if desired, as soon as the mixer speed has been reduced to below 200 rpm.

e. Set the mixer speed to provide the mixing intensity desired for the flocculation stage at the low speeds (30 to 100 rpm) where most jar testing work is carried out.
f. After completion of the flocculation stage, allow the contents of the jars to settle for the desired periods.

12. Carry out visual observations for each step (floc formation speed, floc size, etc.)
13. At the end of the settling period, carry out sampling of the supernatant and laboratory analysis as desired.

6.6 Interferences

- Variations in suspension temperature, sampling and agitation methods, and time between sampling and start of the determination significantly affect the results.
- Avoid sun exposure during the test as this can impact settleability.

6.7 Recommendations

- Stir the initial sample to be sure it is representative.

6.8 Safety

- Use laboratory gloves and goggles;
- Wash hands after testing is ended.

7 MAINTENANCE

7.1 General

The CLM requires very little maintenance, other than cleaning and occasional minor lubrication.

7.2 Cleaning

The unit should be cleaned up immediately after each run, particularly the jars. If solids such as floc are allowed to dry out on component surfaces, they may be much more difficult to remove later.

Always clean with a non-abrasive cleaner for plastics with a brush having soft bristles. Avoid using brushes with hard bristles that could scratch the inside of the plastic surfaces.

Rinse with clean water (<35°C), or wipe down with a damp cloth, as appropriate. **Do not use organic solvents such as acetone or alcohol, which may damage plastic surfaces or paint finishes.**

7.3 Lubrication

All bearings in the CLM are oil-impregnated bronze, and should require lubrication only very occasionally. If the mixer seems rough or noisy, a small amount of light oil can be applied to the paddle shaft bearings.

7.4 Tools

No special tools are needed for operation and maintenance of the CLM. All screw are standard types (slotted, Phillips, or Hex head) and drivers for these are easily obtainable everywhere.

Included with the CLM is a small Allen key for adjusting the miter gears if required.

8 WARRANTY

What we cover:

MCR warrants its instruments and accessories to be free from defects in materials and workmanship under normal use and service for a period of 12 months from the date of shipment from MCR. If you experience any problems with our products, just phone, fax, email, or write and we will make every effort to resolve the matter to your satisfaction.

If your instrument becomes defective within one year of purchase, MCR will repair or replace your instrument free of charge, including surface shipping costs.

What we do not cover:

MCR is not responsible for replacing parts damaged by accident or neglect. Your instrument must be installed and operated according to instructions in the User's Manual. Damage from corrosion is not covered. Damage caused by customer modification of the instrument or used with viscous liquid is not covered. This warranty covers only MCR products and is not extended to equipment used with our products.

Shipping: Although our instruments are built to withstand hard use, we cannot be responsible for damage incurred during shipment. Therefore, to avoid both cosmetic and structural damage if the instrument is shipped in the future, we recommend that you save the original packing material in which we shipped the instrument.

Obtaining Service: Please contact us for repair service. Never ship an instrument to us without prior telephone or written contact. Often the problem is a relatively simple one that you can solve yourself with our direction.

If you are within North America pack the instrument well; insure it; and ship it back to us. If the instrument is under warranty, we will repair or replace the unit and pay for roundtrip shipment. If the instrument is not under warranty shipping costs, both ways are your responsibility.

If you are outside North America, you are welcome to send the instrument for a free repair within the limits of the warranty. You will be responsible to pay for shipment to us, duties and documentation costs outside North America. We will pay for return shipment. If it is not under warranty, you will be responsible to pay for roundtrip shipping, duties and documentation costs outside North America.

9 SPECIFICATIONS

Items	***CLM4***	***CLM6***
Basic features		
Number of stations	4	6
Sample volume	1000 mL	1000 mL
Sample container (jar) volume	1300 mL	1300 mL
Mixer speed range	30 to 300 rpm	30 to 300 rpm
Electrical supply (to mixer unit)	12V DC	12V DC
Maximum current draw	5.0 amp	5.0 amp
Dimensions		
Base unit	Coming soon	
Shipping carton	Coming soon	
Weights		
Base unit alone	Coming soon	
Base unit with carton	Coming soon	
Accessories (jars, baffle dosing module, power supply, etc)	Coming soon	
Total equipment weight	Coming soon	
Total shipping weight with carton	Coming soon	
Materials of construction		
Base unit, mixbar assembly, baffles dosing module	Aluminum and PVC, with epoxy paint coating	
Paddles and shafts	Stainless steel 304	
Paddle system bearings	Oil-impregnated bronze	
Paddle system gears	Hardened steel	
Sample jars	Clear acrylic	
Background curtain	Styrene plastic	

10 SPARE PARTS

The following spare parts are available from MCR:

- Jar with graduated scale with or without sampling ports;
- Transformer 12V;
- 304 SS paddles
- Carrying case

11 TECHNICAL ASSISTANCE

If you have any questions about the use of this product, please contact us at:

MCR Procédés & Technologies
Phone : (418) 650-9154 (Alain Durocher)

e-mail : adurocher@mcrpt.com