



Biotech

Instructions for Use

USD 3293

Allegro™ LevMiver® Drive Unit

LMG403



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1 Warnings

1.1 Hazard Icons



WEEE:
Waste of Electrical and Electronic Equipment



Electrical Safety (*high voltage*)



Caution (*general warning*)



Strong magnetic field (*may affect pacemakers*)



Main power switch



CE certified



Earth to Ground.



Information / Notes



Do not operate if you have a Pacemaker.
Stay 33 cm (13 in.) away until consulting with a physician.



Prohibited

1.2 Safety Messages

1. Read and follow all instructions in this manual carefully, and retain this manual for future reference
2. Do not use this instrument in any manner inconsistent with these operating instructions, or under any conditions that exceed the environmental specifications stated.
3. Be sure the power supplied to this instrument matches the specifications indicated on the control box.
4. This instrument should not be lifted. If it is required to be moved, the device should be rolled on a flat surface.
5. If the drive unit is transported or stored in temperatures colder than the operating environment, it is necessary to wait 1 - 2 hours to equalize the internal temperatures of the drive unit before powering on.
6. If the impeller rotation is stopped for unplanned reasons (mains fault or alarm), impeller rotation can only be resumed by intentional operator actions.
7. Prior to servicing the drive unit, always turn the power off using the 'ON / OFF' switch on the front panel of the unit. Unplug, and remove power cord to avoid tangling or breaking.
8. Be sure all power is disconnected before opening, assembling or disassembling the superconductive drive unit or its control box.
9. For full compliance with CE specifications, be sure the appropriate ground connection is made.
10. For technical assistance contact the sales organization from which you purchased the product, or Pall directly.



11. Each LevMixer mixing biocontainer contains a magnetic impeller, which is a source of strong magnetic field within proximity (305 mm /12 in.) of the impeller.
12. Keep the supplied soft magnetic shields on biocontainers, magnetic chargers, and impellers when not in use.
13. This instrument is not intended to be used with flammable liquids / substances or in hazardous atmosphere. Use of the LevMixer with flammable liquids /substances could lead to a fire, injury, or loss of life.
14. The machine is intended for indoor use in atmosphere not containing corrosive substances.
15. The frame and body of the machine consists of 304 stainless steel and may be cleaned with water and isopropyl alcohol.



Do not:

- *Open the machine or control box while the drive unit is plugged in.*
- *Submerge the drive unit in water. The unit outer surfaces may be cleaned and sanitized by wiping with a mild detergent solution.*
- *Position the machine in the way that the power switch on face panel is difficult to operate.*
- *Obstruct access to outlet where machine is plugged to power line. Keep point of connection visually and physically easy accessible.*
- *Cut the ground plug.*



Caution.

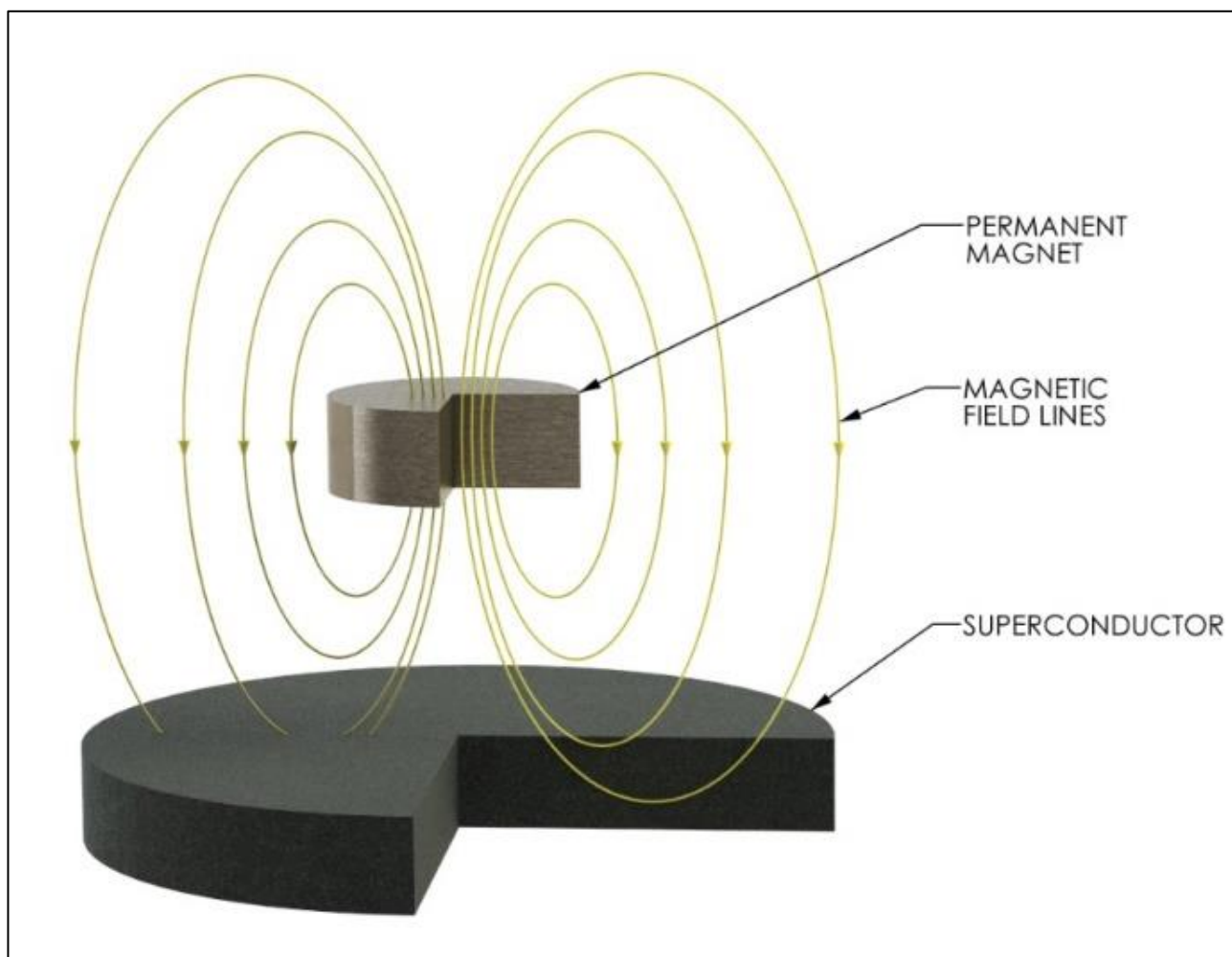
- *Ensure the system is turned off before cleaning the device.*
- *Disconnect all power before servicing.*
- *Disconnect all power before servicing.*
- *Disconnection of the Protective Earth Connector may impair the protection provided by the system.*
- *Disconnection of the Protective Earth Connector may impair the protection provided by the system.*
- *Mains outlet used to power the equipment must be within 3 meters of the device and easily accessible.*

2 System Overview

2.1 Introduction

The LevMixer's mixing technology is based on non-contact magnetic coupling between conventional permanent magnets in the impeller and superconducting material in the drive unit. Superconducting material traps the magnetic field generated by the permanent magnets and locks 'the magnetic field in memory,' in an equilibrium position (figure 1).

Figure 1 – *Non-contact magnetic coupling between the permanent magnet and superconductor. The superconducting material traps the magnetic field from the magnet, resulting in stable mechanical coupling without physical contact.*



The trapped magnetic field behaves like mechanical spring; if the magnet is moved up, down or sideways by outside forces (e.g. gravity or angular torque), it will tend to be pulled back to an equilibrium position. The peculiar nature of magnet-superconductor interaction ties the two bodies together resulting in a very stable mechanical coupling with finite equilibrium separation.

The cryogenic temperatures (approx. -200°C) required for the superconducting material are achieved by an internal cryocooler (sterling cycle refrigerator).

2.2 LevMixer Single Use (SUS) Mixing System

The mixing system hardware has three major components:

1. Superconducting drive unit
2. Elevated retaining tank (either on dolly or with integrated legs)
3. Drive port that couples drive unit with biocontainer

In addition to stand alone implementation, the LevMixer (LMG403) can be linked directly to other Pall systems such as, the Pall MVP SUSs, or Pall single-use tangential flow system (SUTFF) to allow those systems to control the mixer as part of an automated, integrated solution. This control capability can also be customized accordingly to link with other distributed control system (DCS) or supervisory control and data acquisition systems (SCADA).

2.3 Optional Compatible Equipment

Optional additional functionality is provided through one of two automation controllers (advanced and basic) which facilitate local integration of load cells and probes for use in the mixing applications.

The mixing system can accommodate a variety of standard and custom-designed SUS mixing biocontainers available from PALL.

The Instructions for Use (IFUs) documents listed below, cover the procedures on integration of the LevMixer drive unit to variety of containers (shape and size) offered by Pall. For more details on stainless steel tanks and optional control box, please refer to the following instructions respectively:

- USD 3193: Allegro Cubical LevMixer and Magnetic Mixer Tanks
- USD 3194: Stainless Steel Round Mix Tanks. For use with the LevMixer and Magnetic Mixer Single-Use Mixing Systems
- USD 3295: Basic / Advanced Control Box for LMG403 and MMG403

2.4 Mixing System Components and Accessories

The image below (figure 2) shows an overview of the Allegro LevMixer System.

Figure 2 - LevMixer Drive Uni (B) with an Accessory Box (A), Stainless steel cubical tank (D) and Plastic round tank with Dolly (C).

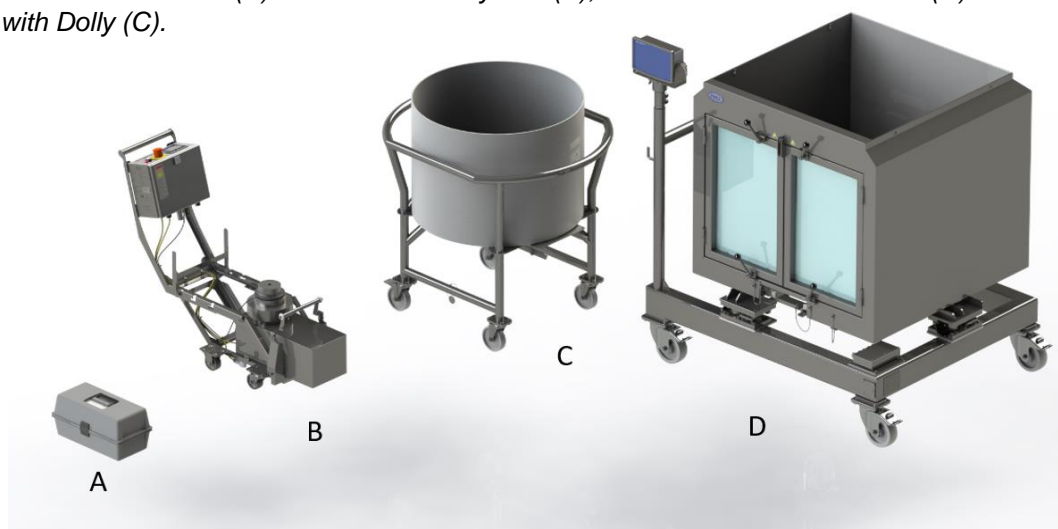


Figure 3 - Key components of the LevMiver Drive Unit.

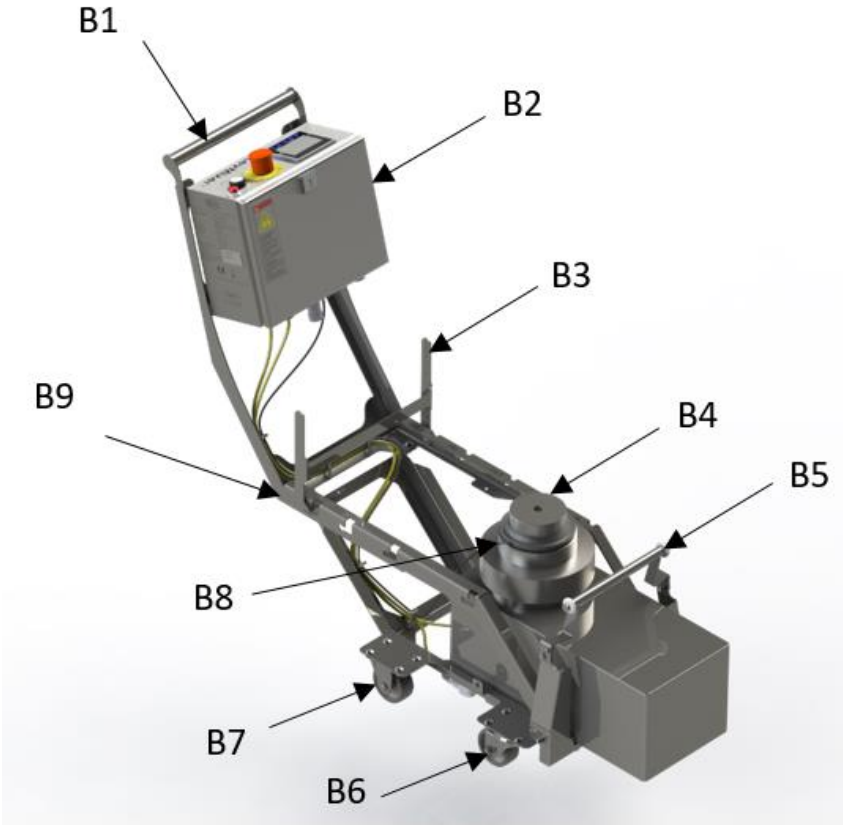


Table 1 - Overview of components of LevMixer Drive Unit in figure 3.

Component	Description
B	Levmixer drive unit
B1	Drive unit handle
B2	Drive unto control box
B3	Latch
B4	Drive head
B5	Guide roller
B6	Front wheels
B7	Rear wheels
B8	Sensor ring
B9	Frame

Figure 4 - *Accessory toolbox (A) in figure 3 contents.*

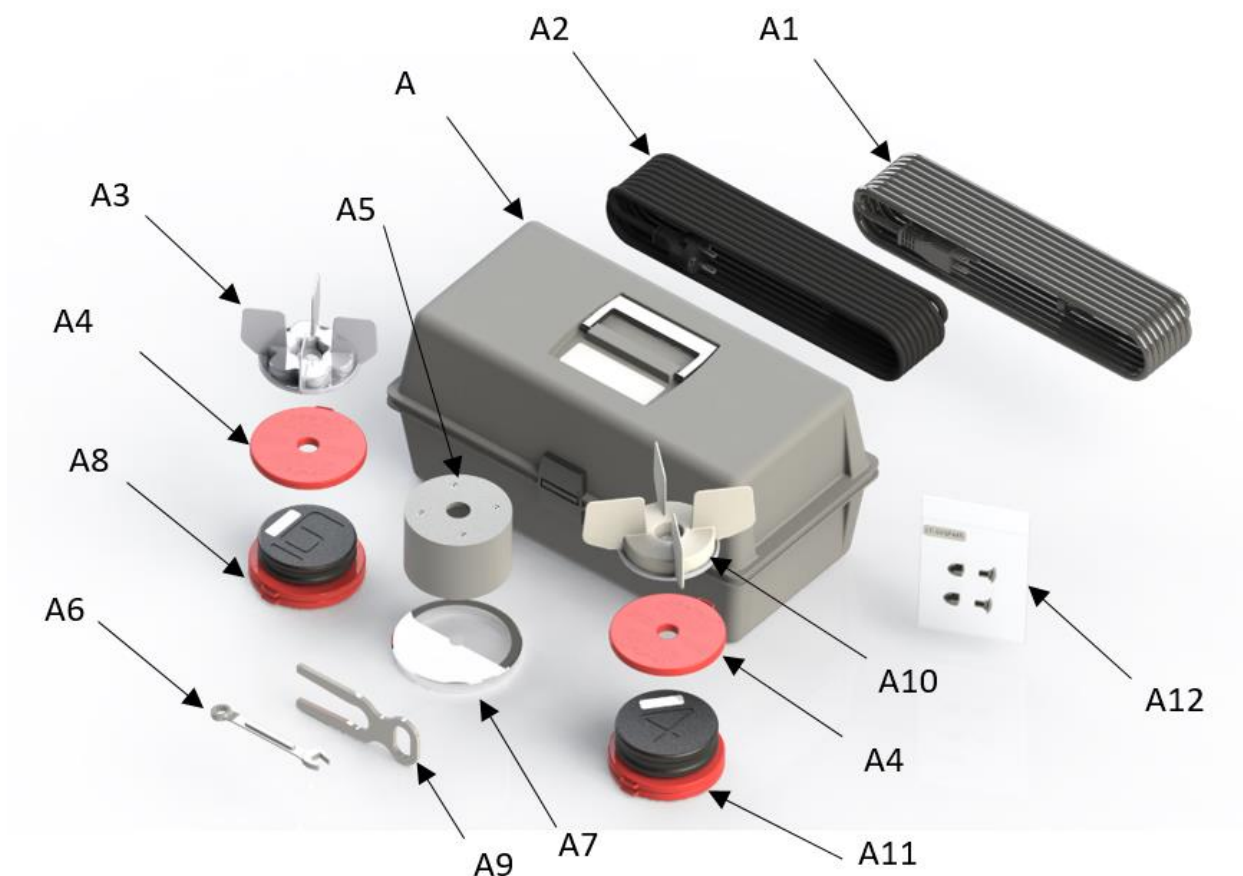


Table 2 - *Overview of components within accessory toolbox (figure 4).*

Component	Part Number	Description
A1	LT-SVSP365	US power cord
A2	LT-SVSP366	EU power cord
A3	LT-SVSP311	6 magnetic impeller
A4	LT-SVSP313	Soft magnetic shield
A5	LT-SVSP309	Magnetic clamp
A6	LT-SVSP314	7/16 in. (11.11 mm) combination wrench
A7	LT-SVSP305	Centering aligner
A8	LT-SVSP307	6 magnet charger
A9	LT-SVSP312	Clip for 1 in. (25.4 mm) drain valve
A10	LT-SVSP310	4 magnet impeller
A11	LT-SVSP306	4 magnet charger
A12	LT-SVSP485	Bolt kit

3 Installing the LevMiver System Hardware

3.1 Unpacking the LevMixer Drive

The LevMixer is shipped in a wooden crate (**Error! Reference source not found.**) with foam insets to protect the unit during transport. Make sure to store the tool box in the close vicinity of the drive unit. The crate should be retained if the drive unit must be shipped for service or repair in the future.

Remove any foam and protective packaging from the drive unit before first use.

Figure 5 – *LevMixer transport crate.*

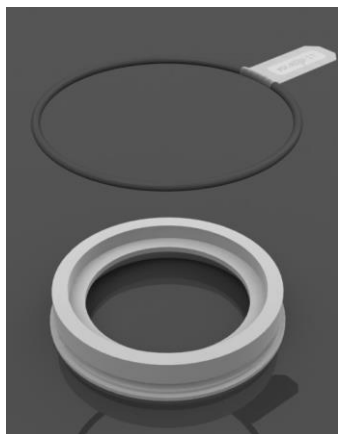


3.2 Interface with O-Ring

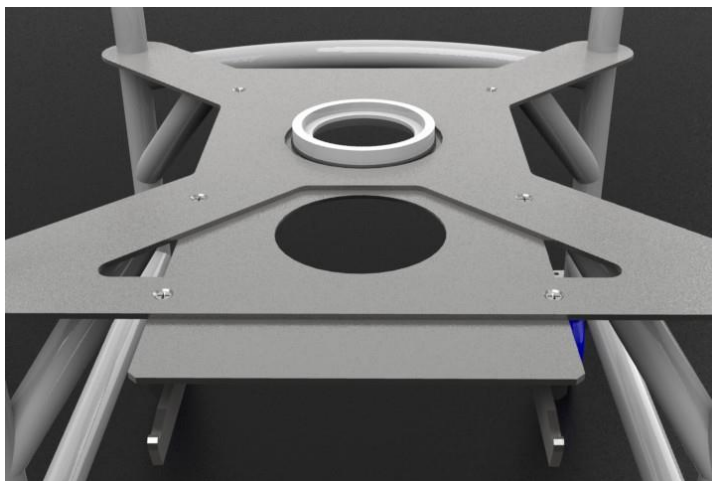
The Interface provides mechanical interfacing of the drive unit with the impeller inside the biocontainer.

Figure 6 – (A) Drive-biocontainer interface and o-ring. (B) Interface is installed in the railed port of the dolly (locked by the o-ring).

A



B



3.3 Dolly – Tank Assembly

If the drive unit is used in combination with a plastic tank on dolly, the following procedure(s) should be used for installation of the tank on the dolly.



Certain larger tanks (>350 L) are constructed in two parts.

1. Both the Dolly and Tank have holes for drive unit coupling. Insert the drive / biocontainer interface into this hole from below and apply the o-ring to secure (**Error! Reference source not found.**). It is not necessary to remove or replace the interface after installation (i.e. after mixing or between batches).

Figure 7 - Installation of the drive-biocontainer interface on dolly with o-ring.



2. Position the plastic tank on the dolly. The bottom of the tank has two holes:
 - Small hole for the biocontainer
 - Larger hole for the drive head.

Line up the larger bottom hole with the drive port on the dolly. The tank hole should locate around the interface.

3. Tanks up to and including 350 L use a centrally located impeller and therefore use the central port dolly configuration. 500 L tanks use SUS with an off-center impeller and therefore use the off-center port dolly configuration. See chapter 3.4 for changing the dolly port configuration.

3.4 Changing Dolly Configuration between Centre and Off – Centre Impeller Port

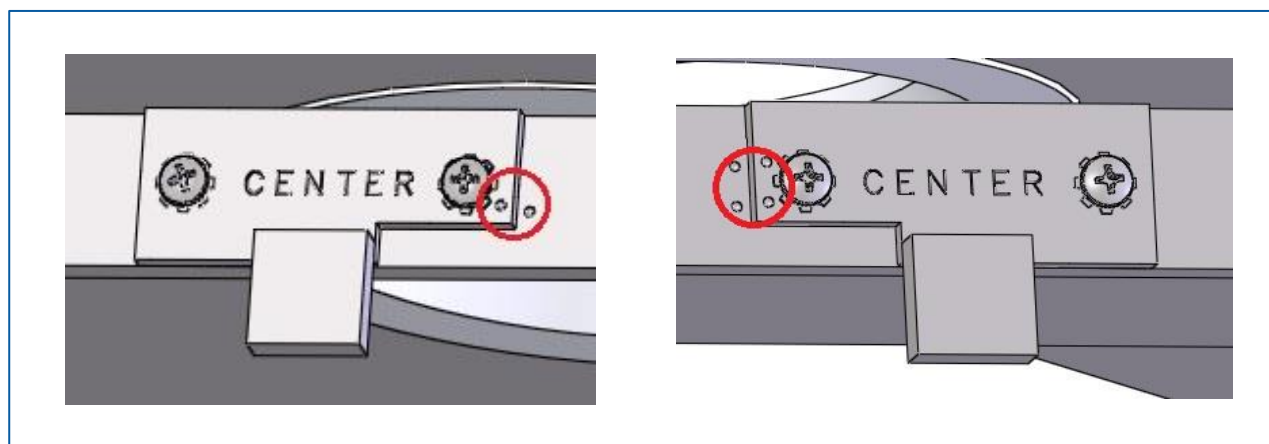
Determine which port configuration is required. Central port (tanks sizes 30 – 350 L tanks) or off-centre port (500 L tanks). Each rail of the dual port has an adjuster attached to the rail with two screws. The right adjuster is marked with two dots and the left adjuster is marked with one dot. The right and left rails of the port are also marked with two and one dot respectively (Figure 8). Right adjuster should always be used with the right rail and the left adjuster with the left rail.

Figure 8 - Rail port orientation – Showing left side vs. right.



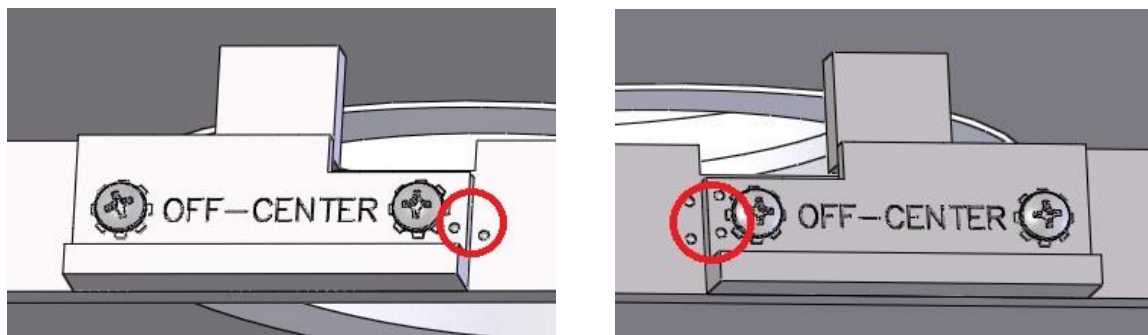
To set the rails for the central port position set the right and left adjusters so that the side with word “CENTER” is visible on both (Figure 9). Ensure that the two dot marks on the right adjuster are located next to the two dot marks on the rail and single dot mark of the left adjuster is located next to the single dot mark on the left rail. Secure the adjusters with the screws provided.

Figure 9 - Rail adjustments for central position (left and right side).



To set the rails for the off centre port position set the right and left adjusters so that the side with words “OFF-CENTER” is visible on both (Figure 10). Ensure that the two dot marks on the right adjuster are located next to the two dot marks on the rail and single dot mark of the left adjuster is located next to the single dot mark on the left rail. Secure the adjusters with the screws provided.

Figure 10 - Rail adjustments for off-centre position (left and right).



3.5 Allegro Mixing Biocontainer Installation

The below procedure describes the basics of installing an Allegro mixing biocontainer in a tank. For more detailed instructions, please refer to the instructions delivered with the stainless-steel tanks.

1. Locate the magnetic clamp and centering aligner (Figure 10). These parts are required for proper Allegro mixing biocontainer installation and alignment. Inspect the centering aligner for damage; if the center hole is deformed, torn or not concentric, discard and replace with an undamaged centering aligner. Assemble the clamp and aligner (Figure 11).

Figure 11 - Centering aligner (left) and magnetic clamp (right).



Figure 12 - *Magnetic clamp assembled with centering aligner.*



2. Verify the correct article code and expiration date on the mixing biocontainer. Remove the outer and inner packaging biocontainer by tearing open at the easy tear notch (Figure 12). Retain the label from the inner packaging according to the Quality policies of your organization.



Do not use scissors or other cutting implements

Figure 13 - *Opening packaging biocontainers via the easy tear notch.*



3. Visually inspect the Allegro mixing biocontainer for shipping damage or imperfections; cuts, tears or punctures; film cracks that are externally rough / sharp to the touch) impeller detached from impeller seat / post; kinked tubing that cannot be unkinked; damaged, missing or detached subcomponents. If any such imperfections are discovered, contact Pall or the user organization's quality group for advice on whether the Allegro mixing biocontainer should be used.



White creases that are not sharp to the touch are typically not a cause for concern.

4. A blue shipping disc is magnetically attached to the outside of the Allegro mixing biocontainer, over the impeller seat. Reverse the Allegro mixing biocontainer to have access to the magnetic impeller with the blue disc. Next, remove the blue shipping disc. Retain this item; this will be used to secure the impeller during subsequent Allegro mixing biocontainer disposal.

Figure 14 – Removing blue shipping disc from Allegro mixing biocontainer.



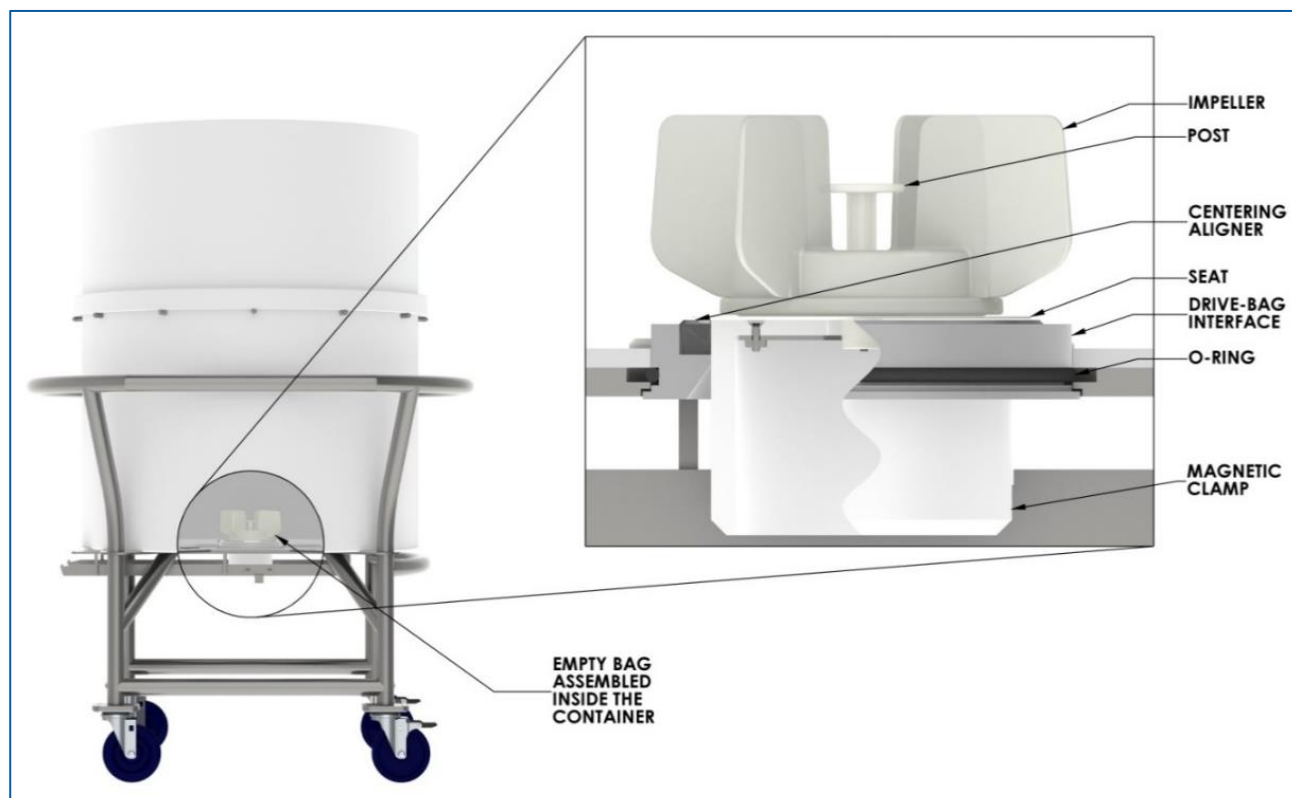
5. Assemble the centering aligner and magnetic clamp on the impeller on the Allegro mixing biocontainer.

Figure 15 - Assembly of Allegro mixing biocontainer with magnetic clamp / aligner assembly



6. Place the Allegro mixing biocontainer in the tank by aligning the magnetic clamp with the large port on the bottom

Figure 16 - Biocontainer-tank assembly with round plastic tank.



Do not:

- Exceed recommended biocontainer capacity.
- Alter the tube and / or impeller configuration.

7. For round plastic tanks, gently pull the bottom drain tube through the drain port opening. For other tanks, please refer to the specific instructions delivered with the tank.
8. Before filling the biocontainer, ensure that the bottom drain tube is clamped. If the biocontainer contains an EZ-Drain*, ensure the drain is fully closed and clamp the drain in place using the provided plastic drain clip.

As the biocontainer starts to fill, gently pull the bottom surface of the biocontainer to remove any wrinkles, especially near the impeller.

3.6 Drive Unit Configuration

The Drive Unit can be used in one of two configurations:

1. Standard
2. Extended.

The configurations can be switched following the procedure.

Each configuration allows connection of the unit to different tank sizes using a universal latch. Positions 1 and 2 are in standard configuration, positions 3 and 4 are in extended configuration. 4 show the different latch positions for each tank size. Marks on the frame at each latch location show proper positioning of the latch.

Figure 17 - Different latch positions for drive unit.

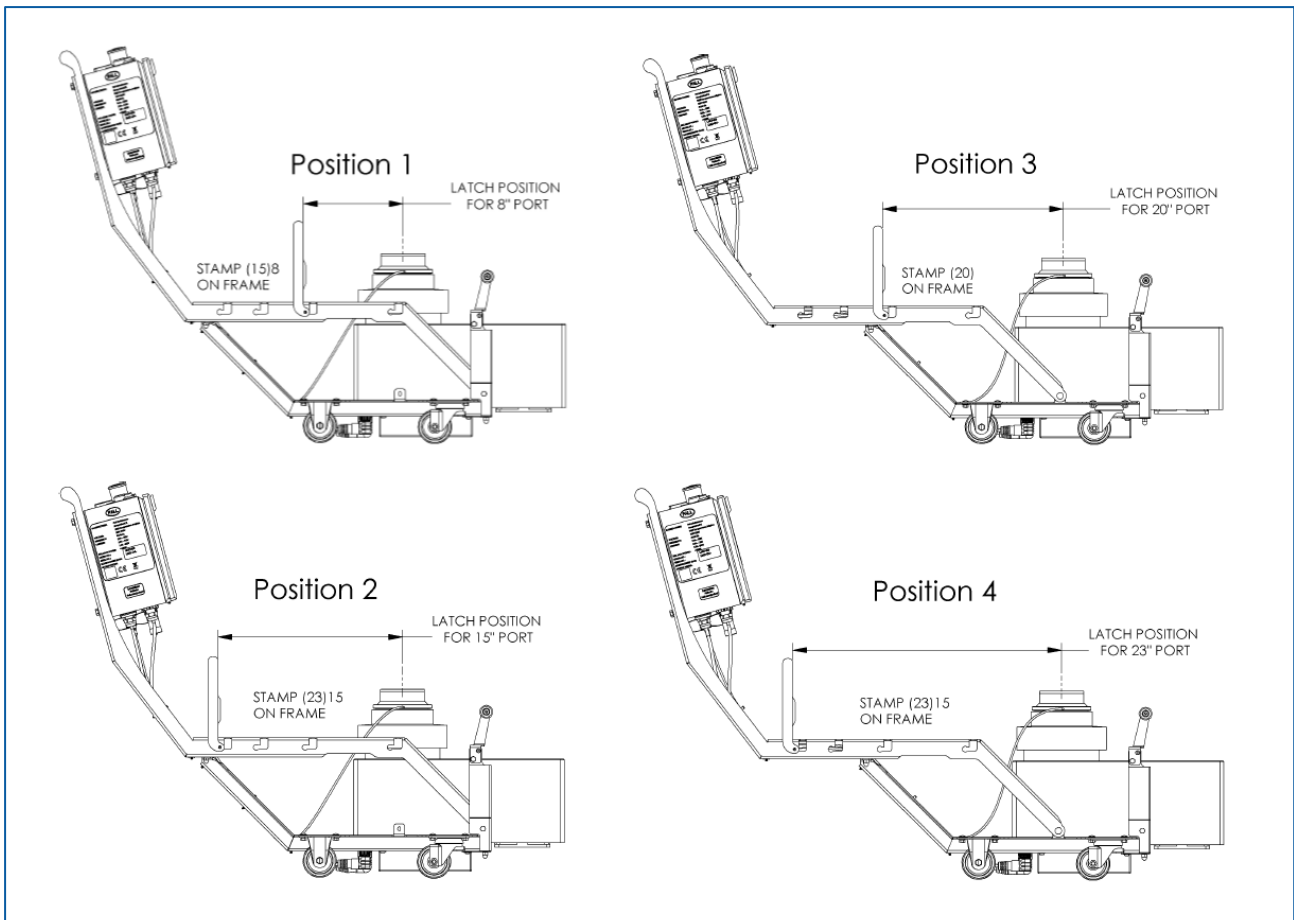


Table 3 - Latch positions/configuration cubical tanks.

Cubical Tank Latch Positions			
Volume	Position	Stamp on Frame	Configuration
50 L	2	(23) 15	Standard
100 L	2	(23) 15	Standard
200 L	2	(23) 15	Standard
400 L	2	(23) 15	Standard
650 L	4	(23) 15	Extended
1000 L	4	(23) 15	Extended
1500 L	4	(23) 15	Extended
2000 L	4	(23) 15	Extended
3000 L	4	(23) 15	Extended

Table 4 - Latch positions / configuration round tanks.

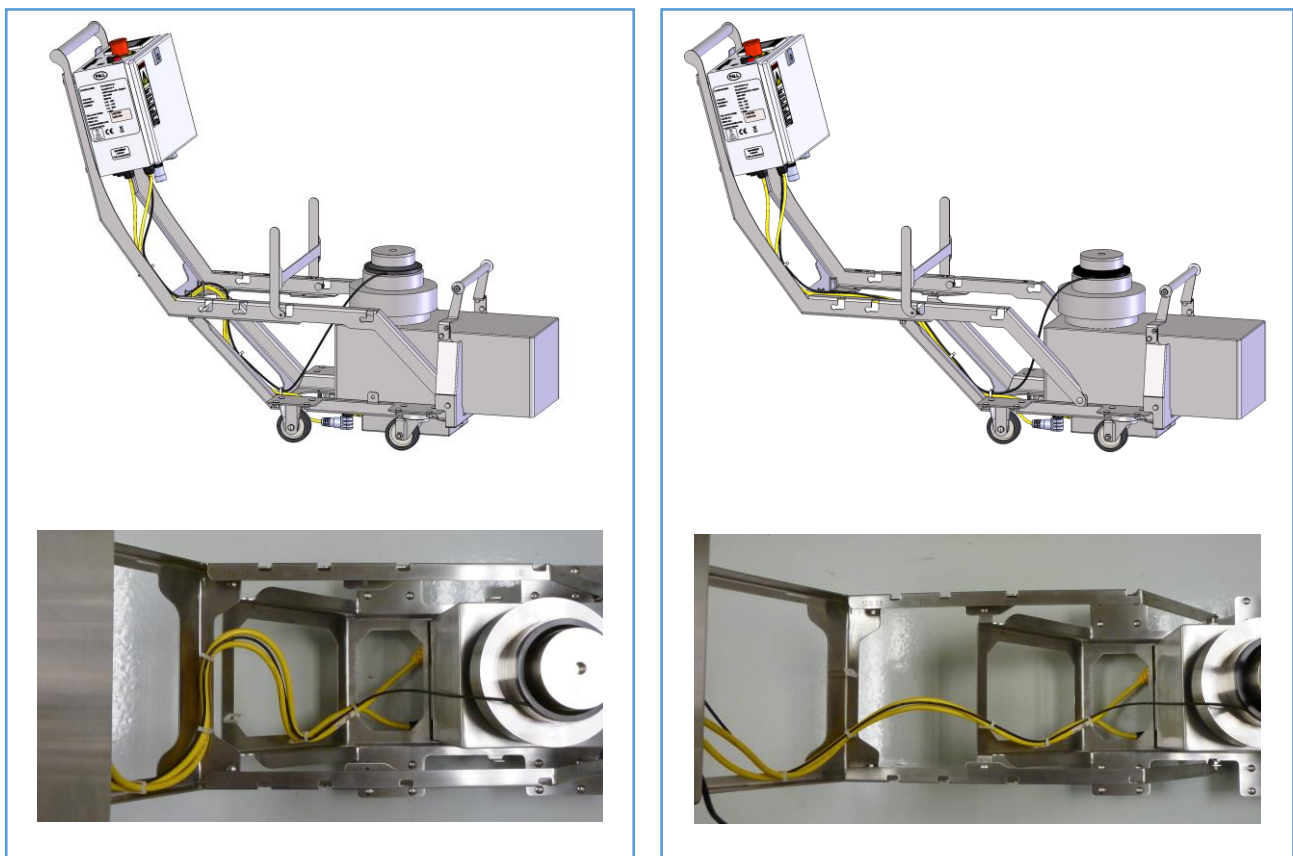
Round Tank Latch Positions			
Volume	Position	Stamp on Frame	Configuration
30 L	2	(23) 15	Standard
50 L	2	(23) 15	Standard
100 L	2	(23) 15	Standard
200 L	2	(23) 15	Standard
350 L	2	(23) 15	Standard
500 L	2	(23) 15	Standard
1000 L	2	(23) 15	Standard
2000 L	3	(20)	Extended
2500 L	3	(20)	Extended

3.7 Drive Configuration Set-Up

To change frame configuration, follow steps below

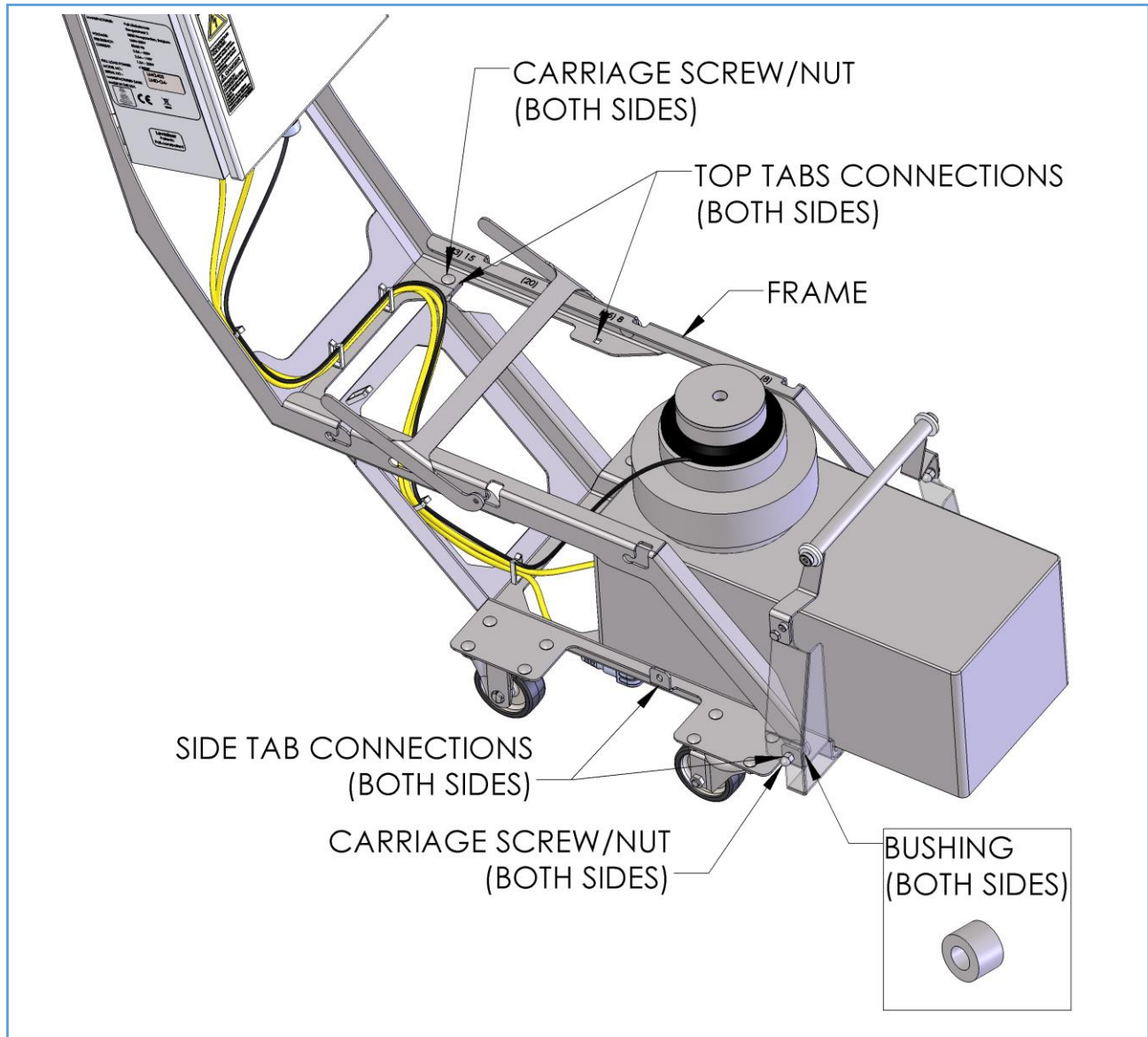
1. Release cables from the two cable clips on the angled cross bar on the frame.
2. At the four frame connection points loosen and remove the two nuts on the side connections and the two nuts on the top connections.
3. Pull out the carriage screws at the four frame connection points and remove the two bushings installed in the side tabs. Hold the frame at the heavier control box side to prevent it from tipping.
4. Move the frame to align it with the other set of connection points corresponding to the new frame configuration.

Figure 18 – Collapsed configuration (left) and extended configuration (right).



5. Insert the four carriage screws into new four frame connection points. The two side bolts should go through bushings. In the extended position, the bushings are flipped to internal side on frame ends compare with collapsed position of frame.
6. Secure the frame with the four nuts at the connection points. Tighten the nuts. Make sure the square portion of screw heads are fitted into the square holes in frame.
7. Secure front bracket with the LT-SVSP485 Bolt Kit through side holes on both sides.
8. Adjust and clip the cables to the frame as per frame configuration displayed in

Figure 19 - Frame adjustment elements.



In extended configuration replace carriage bolts in front side tabs with bolt kit LT-SVSP485 from accessories (both sides).

To adjust the universal latch position, follow the steps below:

Figure 20 – *Procedure to change position of latch.*



1. Initial latch position before removal



2. Rotate the latch clockwise until the axle flats are aligned with the horizontal slots.



3. Slide the latch toward the drive head.



4. Pull up to remove the latch.

3.8 Docking of the Drive Unit to the Tank and Biocontainer



Do not:

- *Remove the magnetic clamp before filling the biocontainer with the minimum required volume.*

1. Remove the magnetic clamp from the biocontainer-container assembly before coupling (Figure 21).
To remove the magnetic clamp, reach underneath the drive port and carefully pull the magnetic clamp downwards until it is free from the biocontainer-tank assembly. Return the magnetic clamp to the supplied.

Figure 21 – *Removal of magnetic clamp.*



2. Make sure that the universal latch is installed in the correct position to match the rail port intended for connection. For corresponding latch and port positions. Turn the latch back towards the handle as shown in step 1.
3. Position the drive unit in front of the rails of the tank.
4. Push down on the drive handle and raise the front wheels off the ground (Figure 22). Align the guide bearings on the drive with the tank guide rails.

Figure 22 – *Aligning drive unit on tank rails.*



Do not:

- Attempt to move tanks on wheels with the drive unit handle while it is docked. Doing so might damage the drive unit. Always use the tank push bar to move the tank.



Caution:

- Be careful to not trap fingers under the latch when locking the drive unit onto the tank.

5. Roll the drive unit along the rails all the way until the bearings come to a stop and rest in the notch located at the end of the rails (Figure 23).
6. Using the drive unit handle, lift the drive unit to a horizontal position (Figure 24). While holding the drive unit in this position, pivot the latch toward the tank so that the cross-bar rests on the hooks in the guide rails.

Figure 23 – *Drive unit pushed until stop on*

Figure 24 – *Lift drive unit and latch to tank.*





Tanks may not look exactly as shown, but the drive installation procedure is the same, regardless of the tank design.

3.9 Docking of Drive Unit to Round Plastic Tank



Do not:

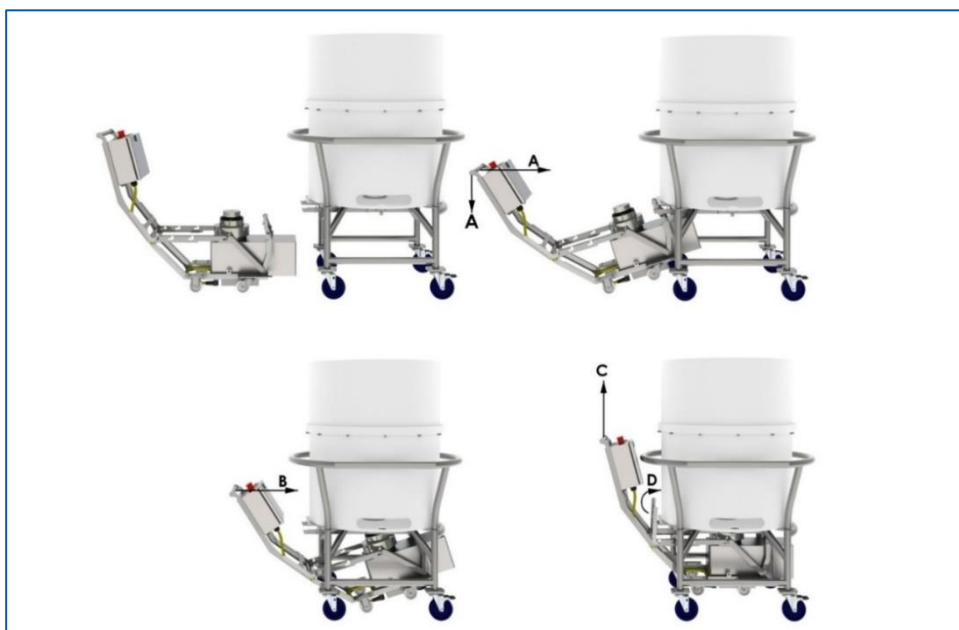
- *Attempt coupling with an empty or dry biocontainer. The impeller may damage the biocontainer.*



Coupling of superconducting drive unit with the biocontainer can be accomplished only when the biocontainer is filled with fluid.

1. Remove the magnetic clamp from the biocontainer-container assembly before coupling. To remove the magnetic clamp, reach underneath the drive port and carefully pull the magnetic clamp downwards until it is free from the biocontainer-tank assembly. Return the magnetic clamp to the supplied Accessories Box for future use.
2. Ensure the universal latch is installed in the correct position to match the rail port intended for connection, and turn the latch back towards the handle (Figure 17).
3. Carefully press down on the drive handle and raise the front wheels off the ground and align the guide bearings on the drive port with the dolly guide rails.
4. Roll the superconductive drive unit along the rails all the way until the bearings rest in the well located at the end of the rails.
5. Using the drive unit handle, raise the superconductive drive unit to an upright position. While holding the drive unit in this position, shift the latch toward the dolly / tank so that the cross-bar rests on the grooves in the guide rails.

Figure 25 – Coupling of superconductive drive unit.



3.10 Removing Drive Unit from Tank



Always place the protective shield back on the biocontainer impeller before disposal.

1. When operating in manual mode, to stop mixer, press and hold the 'STOP' button until progress bar at the top of the touch screen indicates the operation is complete, (takes 2-3 sec). When running in automatic mode, ensure that process is complete, impeller has stopped rotation and message on the display screen reads 'Successful Finish'.
2. Ensure that electrical power remains connected to the drive unit when mixing multiple biocontainers consecutively.
3. Firmly hold the drive unit handle and raise the drive unit slightly to release the latch. Release the latch by pulling it toward the control box.
4. Carefully lower the rear wheels of the drive unit to the floor. Roll the drive unit on its rear wheels away from the dolly.
5. Press down on the drive unit handle until the guide bearings are free from the guide rails.
6. Pull the drive unit away from the dolly until the guide bears are free from the rails. Carefully lower the front wheel to the ground.

7. The superconducting drive unit can now be wheeled to another station for use.
8. When mixing is completed and the biocontainer is completely drained, remove the biocontainer by carefully pulling the impeller seat and the drain tube out of their respective ports.
9. Remove the centering aligner and return to the supplied accessories box for future use. The interface should remain in its locked position for future use.
10. Dispose of SUS mixing biocontainer.

4 HMI Interaction

4.1 User Interface Overview

External electrical connections are made with cables running along the frame. The controls are located on the face panel of the control box. They are:

- Operator touch screen interface
- Quick adjustment keys
- Power button
- Emergency stop push button

Other options including those for remote control through connectors are available on the bottom panel of the control box.

Figure 26 – Control panel top.

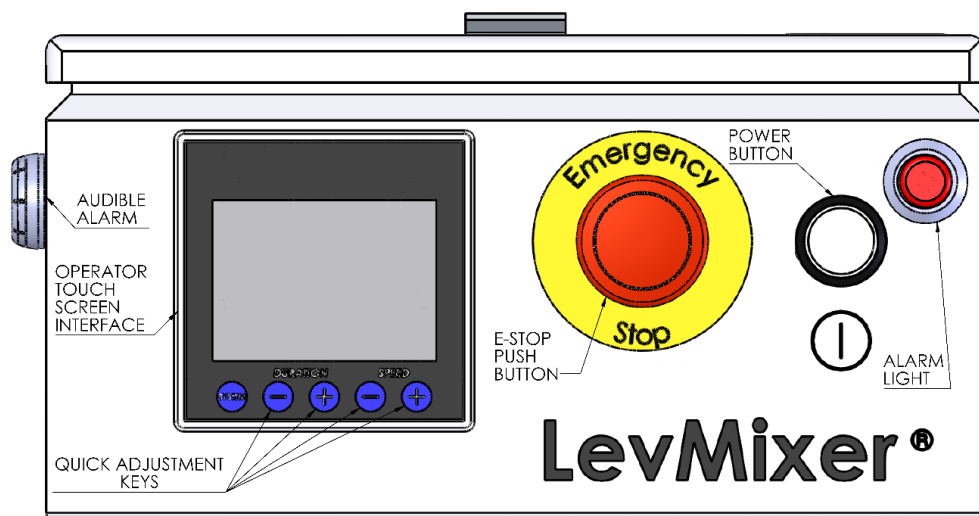
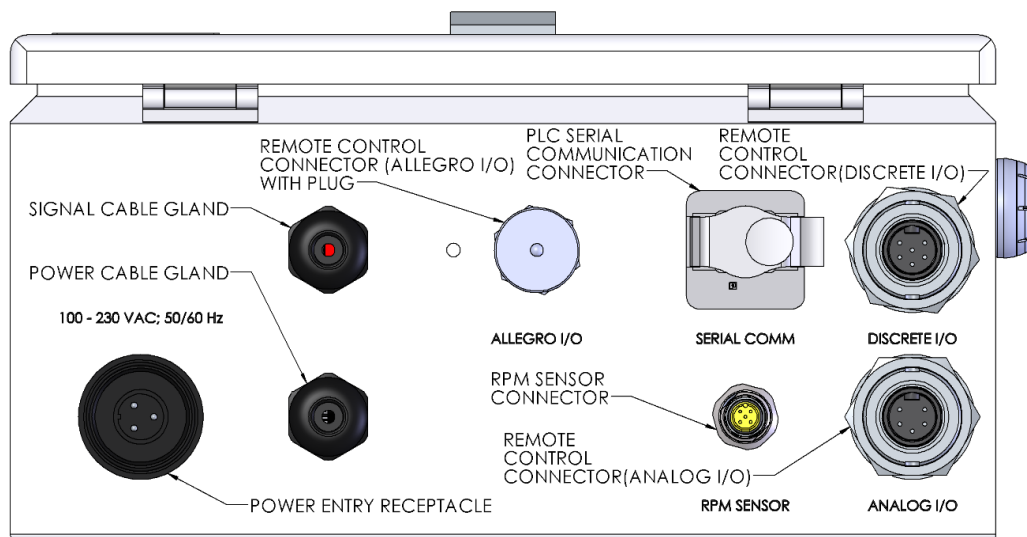


Figure 27 – Control panel bottom.



Correct reading of RPM is available only when the sensor ring is correctly installed on the levitation head, the unit properly charged and the correct impeller is coupled above the levitation head. Incorrect readings may result in an alarm after rotation is started.



In case of emergency the operator can stop rotation of the motor by pressing the E-Stop button on the control panel. This can be done during any mode of operation. Doing so halts the rotation of the motor and activates the Failure mode while leaving other functions of the mixer in operation. To reset alarm, release the E-stop button by pulling it up until it clicks, then acknowledge the alarm on the touch screen.

Most control functionality is provided to the user through the touchscreen interface including activation of functions, display of process information and alarm status.

The LevMixer system can be operated in one of three modes selected by the operator locally from the main menu screen:

1. Manual mode
2. Automatic mode
3. Remote mode

Each mode includes a specific set of functions to support processing requirements.

Two auxiliary modes of operation can be activated by the system:

1. Power up mode, used to monitor the unit is properly charged.
2. Failure mode, used to notify the operator of detected malfunctions.

Both auxiliary modes require operator interaction.



Mixing functionality is not available in either auxiliary mode.

Additionally, there is locked mode of operation which represents variation of remote control from an external system and is intended to support full control of the mixer, using external equipment such as Pall MVP system.

In manual or automatic mode, the drive unit is fully controlled from the local touchscreen interface. Transfer to locked mode of operation happens upon detaching of the plug from connector 'Allegro I/O.' After detaching the plug from the control panel, the dedicated cable (for example from the Pall MVP system) should be connected to allow for locked mode operation. For modes of operation other than Locked mode, keep the plug inserted and tightened up.

When the drive unit is powered on it automatically begins in power up mode. At this stage, the system will determine the current levitation condition and provide directions to the operator. Charging may be required as part of the power up procedure. Operator access to the mixing functions via the main menu is only available after the power up process is successfully completed.

Turning power off while the mixer is in charged condition should only be done through the shutdown procedure. Otherwise it will be detected as an unscheduled power outage and corresponding notification will be displayed upon next power on.

4.2 Charging the Superconductors

To maintain levitation, the superconductors in the levitation head of the LevMixer should be properly charged. Charging is part of the power up mode sequence and is monitored through the power up window on the touch screen.

Charging can only be completed when initiated on a drive unit that has remained in power off condition for at least 25 minutes. The system will monitor charging automatically and prevent operators from by-passing the sequence. The type of impeller (4-magnet or 6-magnet) must be selected prior to charging (Figure 28). It is imperative that the charging sequence be set for the impeller type installed within the SUS mixing biocontainer the drive unit will operate. Pall SUS mixing biocontainers employ the 4-magnet set-up as a standard, although the 6-magnet format is available for select applications. If the LevMixer is transported or stored in temperatures colder than the operating environment it is necessary to wait 2 hours to equalize the internal temperature of the drive unit prior to initiating the power up mode.

Figure 28 - Six magnet charger (LT-SVSP307). During the charging procedure, ensure that the ball bearing assembly is fully resting on the surface of the levitation drive head.



Figure 29 - Four magnet charger (LT-SVSP306). During the charging procedure, ensure that the ball bearing assembly is fully resting on the surface of the levitation drive head.

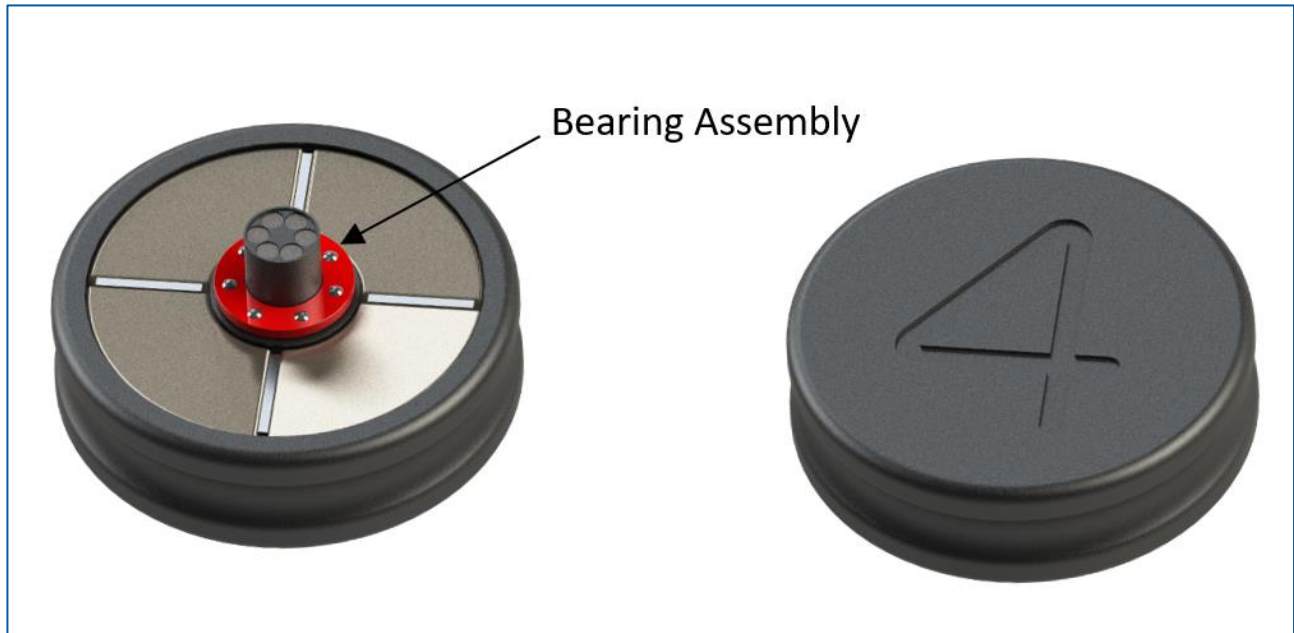


Table 5 - Magnetic charger and test Impeller configuration.

Magnetic Charger	Corresponding Test Impeller	Magnet Configuration
LT-SVSP307	LT-SVSP311	6-Magnet charger and impeller
LT-SVSP306	LT-SVSP310	4-Magnet charger and impeller



The appropriate magnetic charger must be used to set the drive machine for use with the corresponding impeller. The machine will not properly drive an impeller which does not have the corresponding magnet configuration.

Do not:

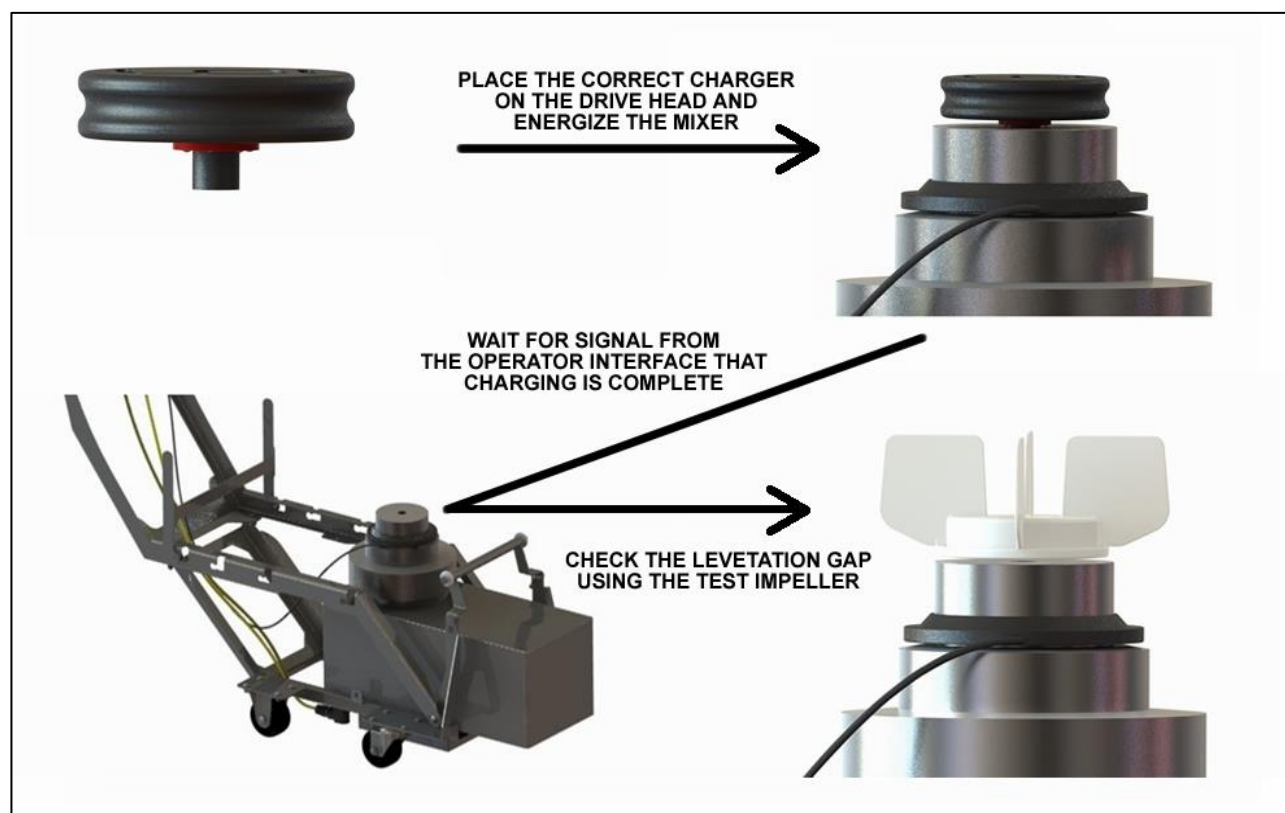


- Use alternative spacing/separating devices when charging the drive.
- Disturb or remove the charger from levitation head until charging is completed.



- Always put the protective shield back on the magnetic charger when the charging procedure is complete.
- Only use the magnetic charger provided in the kit.
- It is critical that the charger be placed on the levitation head for the entire 35-minute charging period.
- Power off for more than 25 minutes is required to reset the superconductors.
- Ensure the charger can rotate free freely when installed in the recess of levitated head. It should sit loose enough to get the correct orientation.
- If at any time the charged drive unit is turned off or unplugged, or if there is a power outage for more than 10 minutes, or if an outage occurs at any moment during charging, the drive unit must be recharged before use – review chapter and repeat the charging procedure steps 1-15.

Figure 30 – Superconductors charging sequence.



4.3 Charging Procedure

1. Connect the superconducting drive unit to the appropriate power source (100-230 VAC 50/60Hz).
2. Select the correct charger, matching the impeller type within the mix biocontainer to be used
3. Remove the protective shield from the magnetic charger and place the charger, bearing end down, on the levitation head
4. Press the main power button on the control box; the button will illuminate when activated. The cryocooler and touch screen will activate. A 'PLACE CHARGER IMMEDIATELY' notification will be displayed on the touch screen to remind the user to complete step 3.
5. Use the touch screen to acknowledge that the charger is in place to proceed to the power up screen.
6. The charging procedure automatically starts after power on. A blinking 'CHARGE IN PROGRESS' will display on the power up window status bar. Certain initial conditions may prevent the system from initiating charging after power on. Corresponding notice will display on the screen if an issue exists. See details of power up logic in Chapter 5.3.
7. Press the blinking 'NONE' button on the power up screen. When the entry screen opens, select the type of impeller: use up and down arrows to set 4-magnet impeller or 6-magnet impeller type according to matching the impeller type within the mix biocontainer to be used. Press 'ENTER'. The selected impeller type will now be shown on the power up screen and a charging timer will indicate the elapsed charging time in the charging status area (bottom row of power up screen).


8. Superconductor charging will take approximately 35 minutes. After charging is complete a blinking 'READY' button will appear on the screen and the 'CHARGED' notice will be displayed instead of charging time. Charging is complete assuming the charger was placed on the levitation head prior to powering on the unit.
9. To proceed, press 'READY' button on screen to get an access to functions control. Remove the magnetic charger and replace the protective shield on the charger.
10. Remove the protective shield from the test impeller and place the test impeller on the levitation head. The impeller should levitate a few millimetres above the surface of the levitation head. This will indicate that the machine is ready for operation.
11. Select manual mode from the main menu. In the manual mode window select the edit button. A manual setup window will appear. In the manual Setup window press the set point button. When the entry window opens set the speed to 50 RPM and press 'ENTER'. The screen will return to manual setup window. Press  button in the top right corner to return to the manual mode window.
12. In the manual mode window check that the run is set as a permanent run with a speed setting of 50 RPM. Press and hold the 'START' button until progress bar at the top of the touch screen indicates the operation is complete (2-3 seconds).
13. The levitated impeller will spin. The levitation gap should remain uniform with no significant wobbling of the impeller.
14. In the manual mode window press and hold the 'STOP' button until progress bar at the top of the touch screen indicates the operation is complete (2-3 seconds).
15. When impeller stops rotating remove it from above the drive head. Do not try to remove the test impeller while it is rotating. Replace the protective shield on the test impeller. The unit is now ready to be placed under the mixing tank.

Figure 31 - Test impeller levitates above the head of the superconductive drive unit during a levitation test.




If the test impeller does not levitate or substantial wobbling occurs (more than 1.2 mm change in the gap) the system must be reset. Turn the system off for at least 25 minutes and repeat the charging procedure. If the problem continues, contact technical representative from your distributor or Pall.

5 Operator Control Interface Guide

5.1 Navigating the LevMixer Control Screen

Each screen in the LevMixer control software has several common elements.

1. The window bar shows the name and / or status of each screen.
2. To return to the previous screen, press the back button  in the upper right corner of the screen.

3. Critical operating commands such as start, stop and pause are protected from accidental activation by a delay function. To activate these commands the operator must press and hold the command button until the indicator bar in the top of window completely fills (2-3 seconds).
4. Time is indicated on the operator interface in hh:mm format unless otherwise specified.
5. Each operation mode has its own interactive screen, which is either displayed automatically (failure, power up) or by operator choice from the main menu.

5.2 User Access Levels

Login function is available through the 'PW' button in the left upper corner of each screen (except informational screens and entry screens). All passwords are group passwords, with a minimum of six uppercase, lower case or numeric characters. In total three group logins are available:

1. Operator
2. Supervisor
3. Maintenance

The login time is controlled via a program setup parameter. Access is automatically set to the default (common) level upon expiration of a prescribed time since last login. Access to LevMixer control software functions is supported using the following levels:

Common (default) functions

- Use of power up, manual and locked mode for full access
- Use of failure mode interactive screens for full access
- Use of auto mode and remote mode for view only access
- No password protection.

Operator: Includes all common functions, plus:

- Use of recipe start access

Supervisor: Includes all common and operator functions, plus:

- Use of auto mode and remote mode for full access
- Access to a limited set of parameters
- Ability to change the password for the supervisor and operator groups
- Ability to change the automatic logout time

Maintenance: Includes all supervisor functions, plus:

- Full access to system and program parameters.
- The ability to skip power up logic.

Follow these steps to enter the passcode for different user access levels and log in using that level's privileges:

1. Press 'PW' on the top left corner of the screen
2. Select the access level from the user login screen choose password to open the password entry screen.
3. When the keypad entry screen appears, enter the passcode for the desired user access level and then press 'Enter'
4. You will now return to the previous screen. Press 'Login'. You are now logged in under the selected user access level.

Figure 32 – User login screen (left), supervisor user password screen (right).

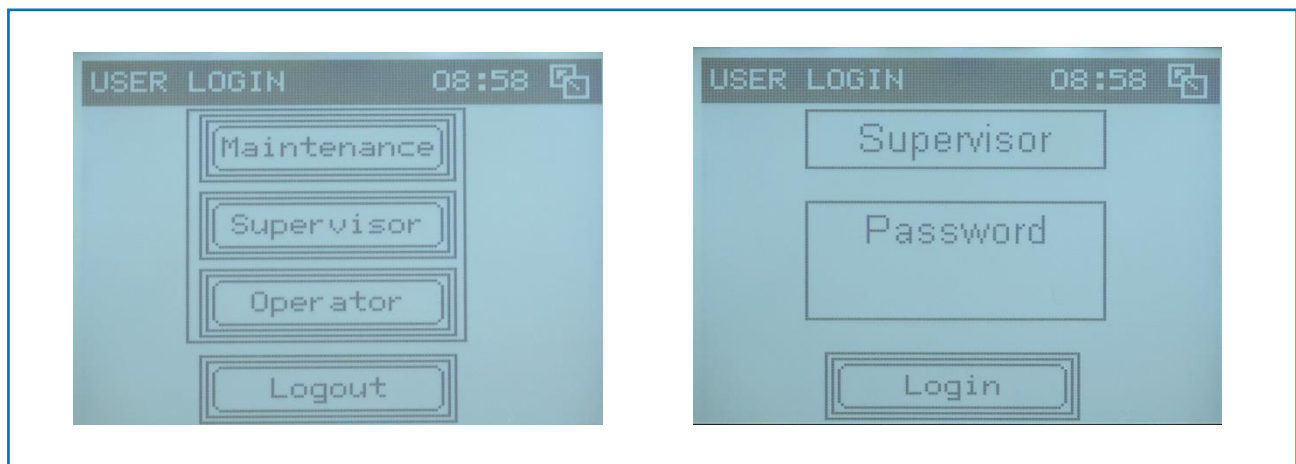
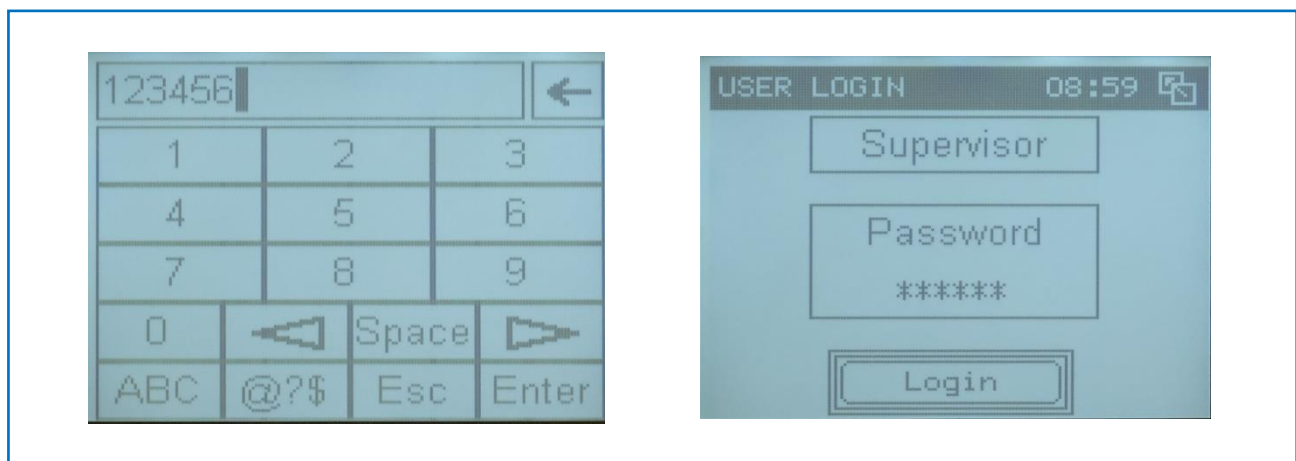


Figure 33 – Password entry screen (left), supervisor login screen (right).



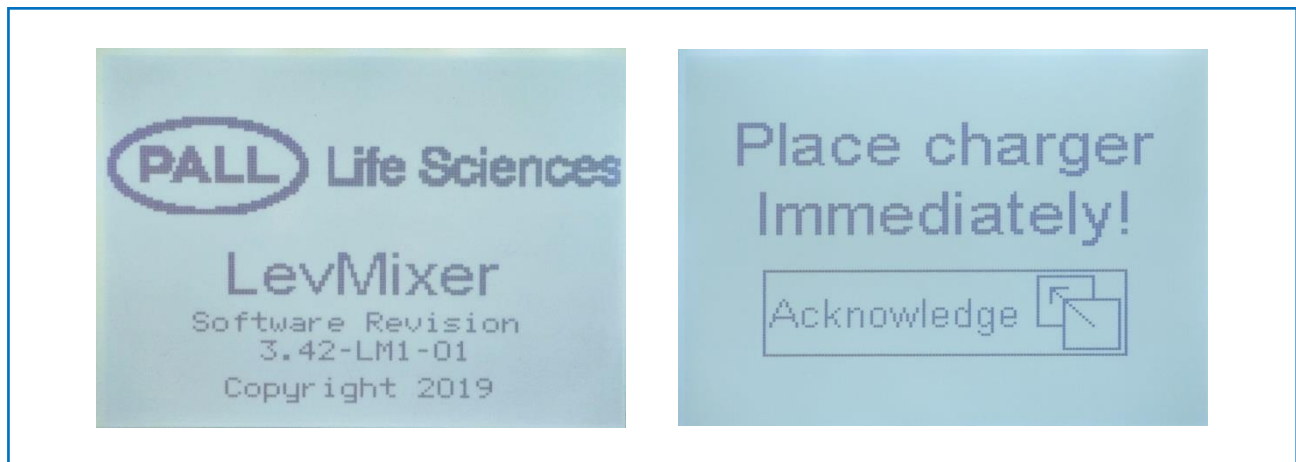
5.3 Power Up

When the drive unit is turned on, the cryocooler will start operating immediately. The system will display the Pall LevMixer screen with the software revision number shown. The unit will then automatically enter power up mode and interactive power up process begins.

When an uncharged unit is started the user is reminded to place the charger on the levitator head.

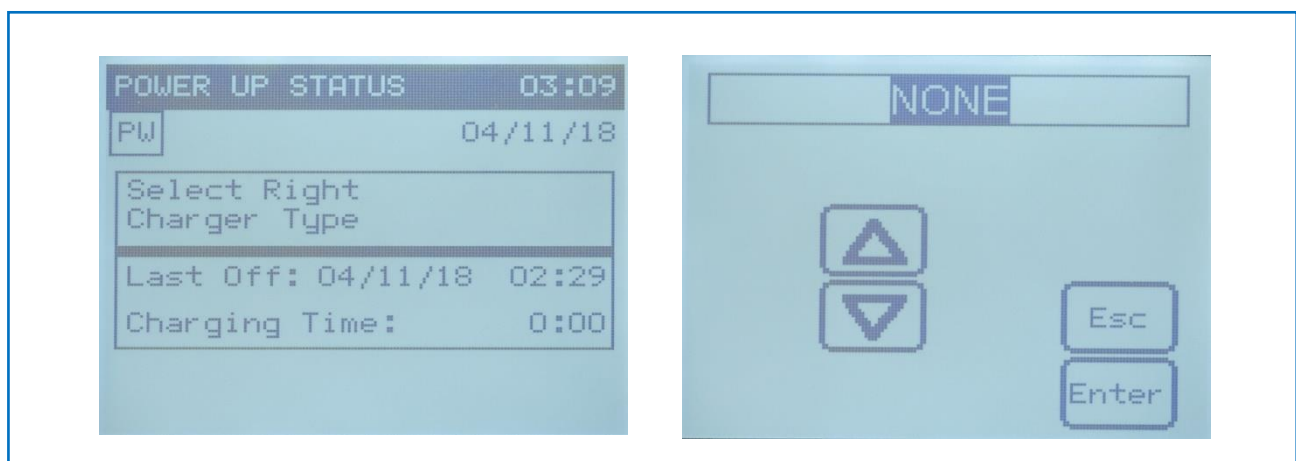
The power up process screen prompts the user to input the type of charger in use (4-mag or 6-mag) and shows the date and time of last power off as well as the elapsed time of the current charging process. The selected charger type is shown on the screen upon its introduction.

Figure 34 – LevMixer screen (left), place charger screen (right).



Readiness of the unit for levitation is indicated by a blinking 'READY' button on the screen after completion of the power up process. Selecting this button opens the access to functions control.

Figure 35 - Power up screen (Left), charger selection screen (Right).



During the power up process, the software will direct the operator to follow a prescribed process until the power up is completed so that the superconductors are properly charged.

One of three scenarios are possible when the unit is started:

1) Superconductors are not charged.

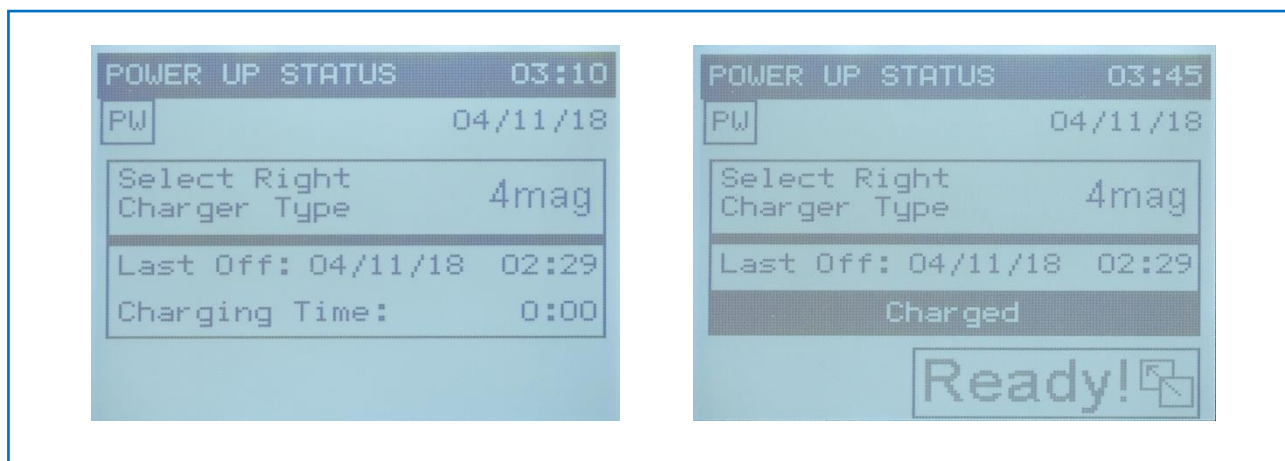
Charging is required. This happens when the unit is powered off for 25 minutes or more. The operator must follow the charging procedure.

Charging will start automatically after the power is turned on. The 'Place Charger Immediately' notice will display on the touch screen. By acknowledging the user confirms that the charger is installed and the unit can proceed to the power up screen. A blinking 'Charge in Progress' will be displayed in the window status bar and the elapsed charging time will be indicated in the charging status row, along with information on the last power off date and time (Figure 36, left)

Screen controls require the user to select the type of charger required for the impeller to be used for mixing (4-mag or 6-mag). This is a necessary step in the completion of power up. The charger selection screen is accessible by pressing the button labelled 'NONE' on the power up screen. Choose the appropriate charger using the arrows and press enter. The selected charger type is displayed on the power up screen (Figure 36, left)

Upon completion of the prescribed charging time (35 min), the charging status will indicate 'charged'. If the system already meets the second condition, a charger is selected different from 'NONE', a blinking 'READY' button will appear on the screen (Figure 36, right). By pressing the 'READY' button, the user gets access to the function controls. At this point the unit is ready for mixing.

Figure 36 – Power up charging status (left), power up ready status (right).



2) Superconductors are partially charged.

Power down is required. The on-screen notification shows 'COUPLING INSUFFICIENT!' The operator must:

- Turn the unit off.
- Wait for at least 25 min.
- Follow the charging procedure.

This mode can occur if the charged unit was powered off for 10 min to 25 min, or if the unit was powered off during the charging process. At least 25 min of power off time is required to reset the superconductors for charging.



Powering ON of the unit during the required power-off time will restart the 25min power-off period resulting in an extension of the overall wait time.

3) **Superconductors are completely charged**

Once the 'READY' button is shown on the power up screen, and the correct magnet number is selected, the unit is ready for use. Press the 'READY' button to get access to functions control. This happens if the unit being in fully charged condition is powered off for less than 10-minutes.

If the mixer is powered-off without using the shutdown procedure the 'Unscheduled Power Off' message with time stamp will appear during power up. Read the screen directions carefully and select 'Acknowledge' to continue.

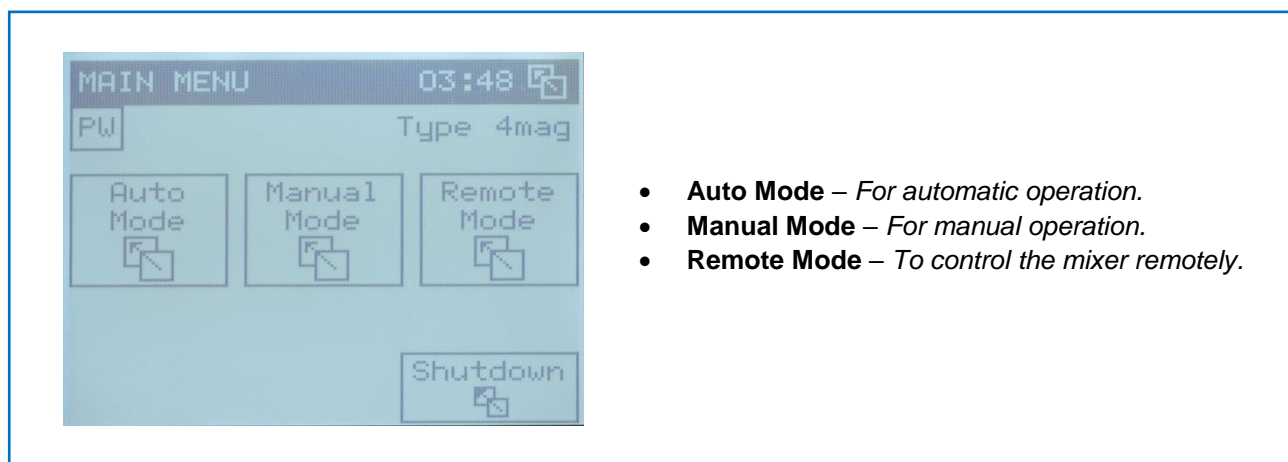
For normal shutdowns follow the shutdown procedure available through the main menu screen. To power off correctly follow the following steps:

1. Press the shutdown button on the main menu screen.
2. The screen will display confirmation of safe shutdown mode and a cancel button appears in the lower right corner.
3. The unit can now be safely turned off by pressing the main power switch button on the face panel
4. Shutdown can also be cancelled and the operator returned to main menu screen by selecting the cancel button on the screen.

5.4 Operating the LevMixer System

To select the mixer's operation mode, press one of the buttons in the main menu (Figure 37).

Figure 37 – Main menu screen.



The three mode screens are the locations for setting mixing parameters; Automatic, manual and remote. Activation of these modes is controlled from the screen locally.

5.5 Automatic Mode

Automatic mode is used to run mixing according to recipes; lists of instructions composed by the user to run the mixing process at different speed settings and / or at certain time schedules. The LevMixer software includes a library of 10 recipes. Each recipe contains up to 10 instructions executed consecutively during a run. Each instruction consists of 3 user defined parameters:

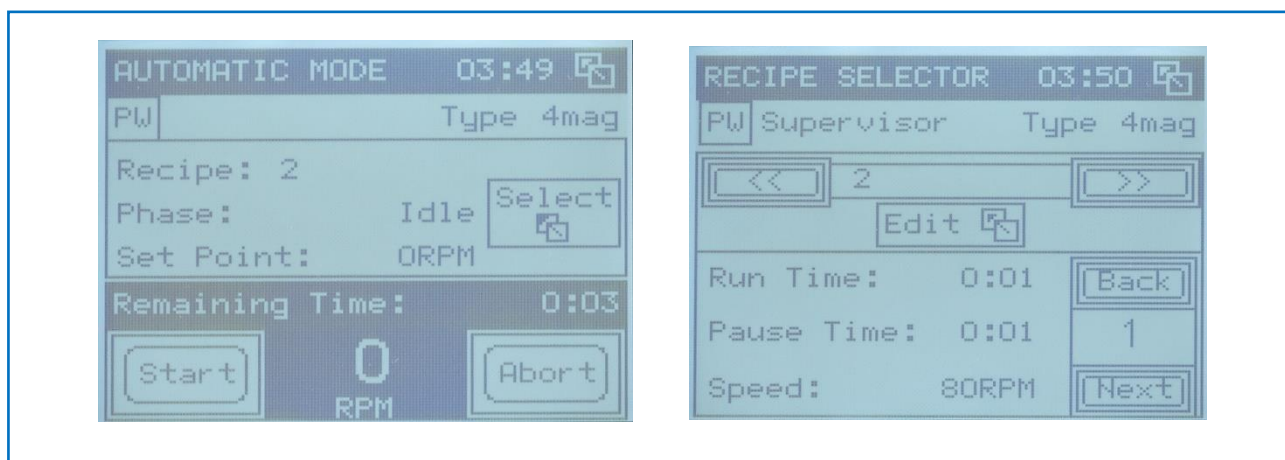
1. Duration of mixing phase
2. Duration of pause phase
3. Speed of rotation

All the recipes have duration of mixing and pause factory pre-installed to values of zero, and speed of rotation set to 20 RPM. Any recipe with all mixing phase durations set to zero are considered an 'empty' recipe. If the operator tries to run such a recipe a notification is displayed on screen.

To simplify exchange of recipes between drive units a migration function is available at the supervisor level. The feature allows import / export of the entire library from / to a removable memory card (Chapter 7.3.3).


Operators can load, start recipe run and view a recipe's instructions. Supervisors and maintenance can pause / resume or abort recipes as well as edit their contents or change the name under which the recipe is stored. To use the automatic mode to run the mixer according to a recipe, press 'Auto Mode' on the main menu. The 'Automatic Mode' screen opens and lists the currently loaded recipe. Status bar indicates 'AUTOMATIC MODE'.

Figure 38 – Automatic mode screen (left), recipe selector screen (right).



5.5.1 Loading Recipe

To load a recipe, follow the following steps:

1. On the automatic mode scene, press select. The recipe selector screen will open (**Error! Reference source not found.**, right).
2. Use the buttons on the recipe selector screen to load recipes and view their contents.
3. At the top of the screen, press the arrow buttons to move through the list of recipes.
4. In the lower right corner of the screen, press the back or next buttons to move through the individual instructions in the selected recipe.
5. On the recipe selector screen, press the back button  in the upper right corner of the screen to load the selected recipe, and return to the automatic mode screen.

5.5.2 Running a Recipe

To run the recipe listed on the automatic mode screen, press and hold the start button. The mixer will start according to the recipe's instructions and 'Routine in Progress' will appear in the menu bar. The time remaining in the recipe is listed at the bottom of the screen. The window status bar will show a blinking 'Routine in Progress'.

Upon finishing the recipe run, the screen will show 'Successful Finish' with a time stamp, run duration and name of the recipe finished. To resume to the auto mode screen, press the 'OK' button.

When failure mode is activated during a recipe run, the operation is paused automatically and can be resumed upon failure reset. 'Unscheduled Finish' is displayed with a time stamp, run duration and name of the recipe after finishing the recipe run. To resume to the auto mode screen, press the 'OK' button.



Motor failure and cryo-controller failure require power cycling. The recipe run will be cancelled in this case.

5.5.3 Aborting a Recipe

Supervisors and maintenance user levels can abort running recipes. To abort a recipe that is currently running, press and hold the 'Abort' button. When a routine is aborted the unscheduled finish screen with a time stamp, name of the recipe aborted and run duration will open. To resume to the manual mode screen, press the 'OK' button.

5.5.4 Pausing and Resuming a Recipe

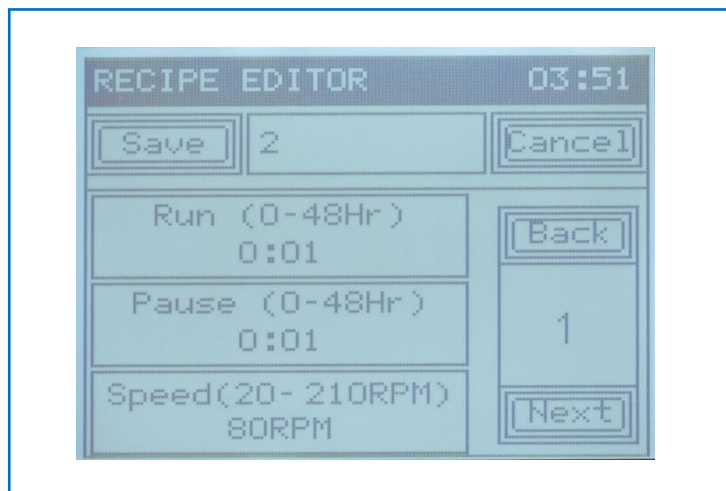
Supervisors and maintenance user levels can pause and resume recipes. For a recipe that is currently running, press and hold the 'Pause' button. A blinking 'Routine Paused' status is displayed in the status bar. To resume the recipe from where it was paused, press and hold the 'Resume' button.

5.5.5 Editing a Recipe

Supervisors and maintenance user levels can edit a recipe's instructions. To edit a recipe, follow these steps:

1. Press 'Select' on the automatic mode screen. The recipe selector screen opens.
2. Use the arrow buttons at the top of the screen to scroll through the list of recipes until you open the one you want to edit.
3. Press 'Edit'. The recipe editor screen opens.
4. If needed, press the 'Back' and 'Next' buttons on the right side of the screen to scroll through the list of instructions for that recipe.
5. Each recipe can contain up to 10 instructions
6. Set the parameters to use for a specific instruction.
7. Press 'Pause' to set the length of time the LevMixer should pause for that instruction. When the keypad opens, type the length of time to pause and then press 'Enter'.
8. Press 'Run' to set the length of time the LevMixer should run for that instruction. When the keypad opens, type the length of time to run the mixer and then press 'Enter'.
9. Press 'Speed' to set the RPM set point at which the mixer should run for that instruction. When the keypad opens, type the RPM set point and then press 'Enter'.
10. Press 'Save' to save your changes to the recipe. To return to the automatic mode screen without saving your changes to the recipe, press 'Cancel'.

Figure 39 – *Recipe editor screen.*



To edit the name under which a recipe is stored, follow these steps:

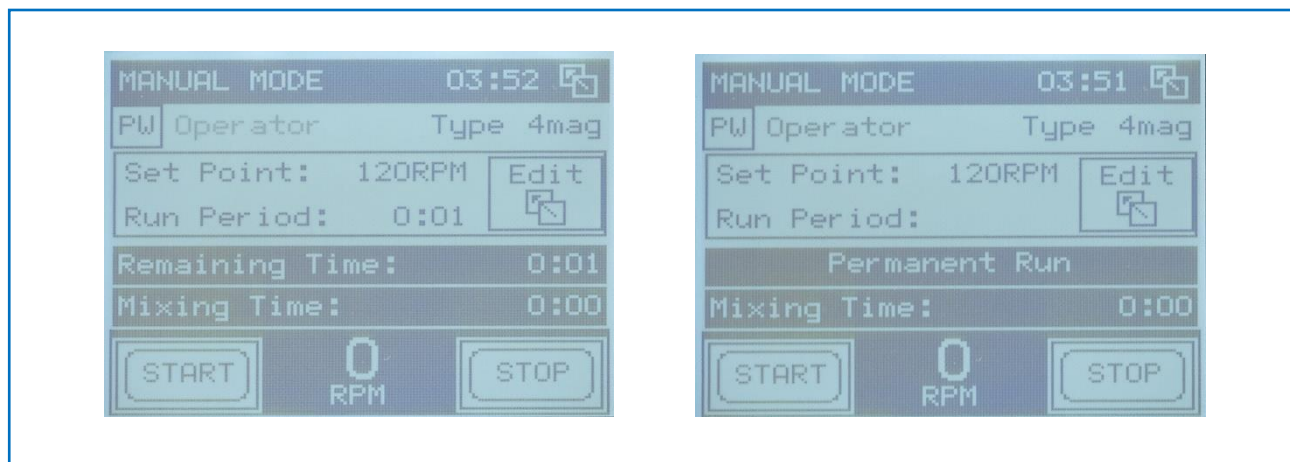
1. Press 'Select' on the automatic mode screen. The recipe selector screen opens.
2. Use the arrow buttons at the top of the screen to scroll through the list of recipes until you find the name you want to edit.
3. Press 'Edit'. The recipe editor screen opens.
4. If needed, press the 'Back' and 'Next' buttons on the right side of the screen to scroll through the list of instructions for that recipe.
5. Press the button with the recipe name in it. An entry screen opens.
6. Use the onscreen keyboard and arrows to change the name of the recipe then press 'Enter'.
7. Press 'Save' to save your changes. To return to the automatic mode screen without saving your changes to the recipe, press 'Cancel'.

5.6 Manual Mode

Use the manual mode to run the mixer either continuously or for a specific amount of time at a given RPM. The manual mode is ideal for mixing operations that have no additional parameters. If the operation requires mixing at different speeds use automatic mode instead.

To use the manual mode, press 'Manual Mode' on the main menu. The manual mode screen will open. The status bar will display 'MANUAL MODE'.

Figure 40 – Manual mode parameters screen (left), manual mode permanent screen (right).



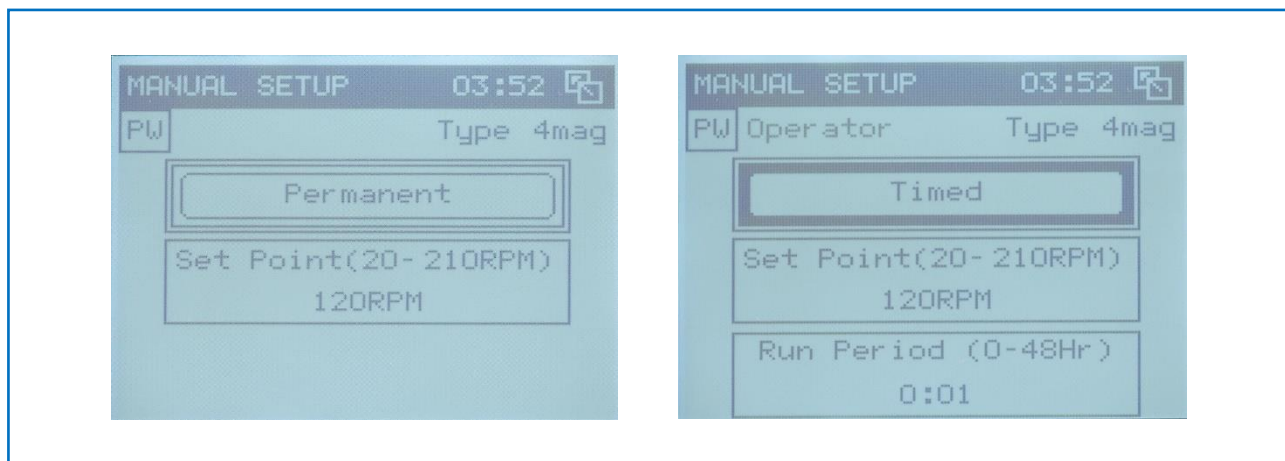
5.6.1 Setting up a Manual Operation

Parameters available for a manual operation are speed of rotation of impeller (RPM) and duration of run (hh : mm). Previous settings are remembered until they are changed manually. Quick adjustment of manual operation parameters is possible from the PLC face panel with dedicated keys regardless of run status.

To select the parameters to use for the manual operation run, follow these steps:

1. On the manual mode screen, press 'Edit'. The manual setup screen opens
2. Press the 'Edit' box to set the RPM set point.
3. In the entry screen enter the RPM set point and then press 'Enter'.
4. Set the time for prospective run.
5. The status 'Permanent' indicated on a switch means it will run indefinitely until manually stopped.
6. To have manual run stopped automatically, specify the length of run. Press the switch to toggle it to times status to allow time setting for run.
7. To set the length of time the mixer should run, press the 'Run Period' box. When the keypad opens, enter the amount of time and then press 'Enter'.
8. Return to the manual mode screen. All parameters are indicated in screen areas with white backgrounds.

Figure 41 – Manual setup of permanent screen (left), timed screen (right).



5.6.2 Starting a Manual Operation

To perform a manual operation, press and hold the 'Start' button on the manual mode screen. The mixer will start and the status will be highlighted at the top of the screen with a dark background: the remaining time (for timed operations) or the 'Permanent Run' (for continuous runs) and neat mixing time. The window status bar will have a blinking 'Run in Progress'.

5.6.3 Stopping a Manual Mode Operation (Permanent Run)

To stop a manual operation that is currently running, press and hold the 'Stop' button. When an operation is stopped the screen will display 'Successful Finish' with a time stamp and run duration. To resume in the manual mode, press the 'OK' button.

When failure mode is activated during the run, the operation is paused automatically and can be resumed upon failure reset. 'Unscheduled Finish' is displayed with the time stamp and net mixing time after stopping the run. To resume in the manual mode, press the 'OK' button.

5.6.4 Stopping a Manual Mode Operation (Time Run)

Timed runs will automatically stop when the run time is complete. The screen will display the message 'Successful Finish' with a time stamp and run duration. To resume in the manual mode, press the 'OK' button.

To stop a timed operation that is currently running, press and hold the 'Stop' button. When the operation stops, the touch screen will display the message 'Unscheduled Finish' with a time stamp and run duration. To resume in the manual mode, press the 'OK' button.

When failure mode is activated during a run, the operation is paused automatically and can be resumed upon failure reset. 'Unscheduled Finish' is displayed with a time stamp and net mixing time after manually stopping or automatic finishing of the run. To resume in the manual mode, press the 'OK' button.

5.6.5 Pausing and Resuming in Manual Mode

To pause the current operation, press and hold the 'Pause' button. To resume the operation, press and hold the 'Resume' button.

5.7 Remote Mode

The remote mode allows you to control the LevMixer from external equipment to which the mixer is connected. Supervisor and maintenance user levels can switch the mixer between remote and local control.

Signal circuits for remote control pass through the control box via two connectors located on the back of the control box. With a remote-control panel, the operator can:

- Start / Stop the motor
- Change the speed of rotation
- Read the speed of rotation
- Read alarms
- Read the unit mode status

While the LevMixer is in Remote mode the impeller rotation control is available only via the remote-control unit. The LevMixer screen indicates speed of impeller for local monitoring only. When the control is switched back to local (LevMixer) the remote-control unit can only monitor the speed of rotation and alarm status.



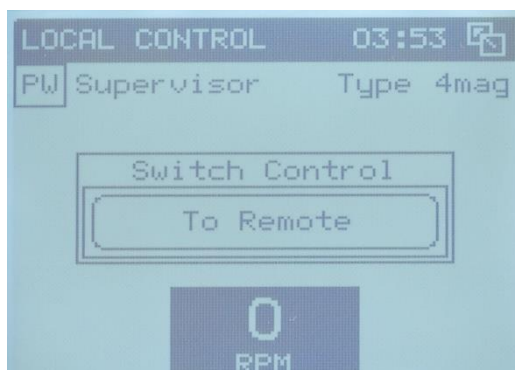
Being set in remote mode, the mixer automatically switches to manual mode stop status if any alarm is activated.

To use the remote mode:

- Press 'Remote Mode' on the main menu. The remote mode screen opens in 'Local Control' status indicated in status bar.
- To switch control to any remote equipment connected to the mixer, first make sure that the equipment is correctly connected to the LevMixer and powered up. Then press and hold the 'Switch Control to Remote' button on the remote mode screen.

When the control is switched to remote panel, the 'Remote Control' status is indicated in the window status bar.

Figure 42 – Remote mode screen.



To switch control back to the LevMixer, press and hold the 'Switch Control Back to Local' button on the remote mode screen. The system will switch to manual mode stop status.

5.8 Locked Mode

Locked mode allows the operator to control the magnetic mixer from external equipment to which the mixer is connected through a dedicated ALLEGRO I/O connector on the back of the control box. In that mode operator of remote panel has an opportunity to switch mixer control temporarily between remote and local panels. Switching between locked mode and normal operation is controlled by a plug connected to ALLEGRO I/O connector.

5.8.1 Locked Mode Operation

To go to locked mode of operation follow the below steps:

1. Pull the plug out of ALLEGRO I/O connector
2. Connect remote panel and Drive Unit with control cable (not supplied)
3. Follow information on the

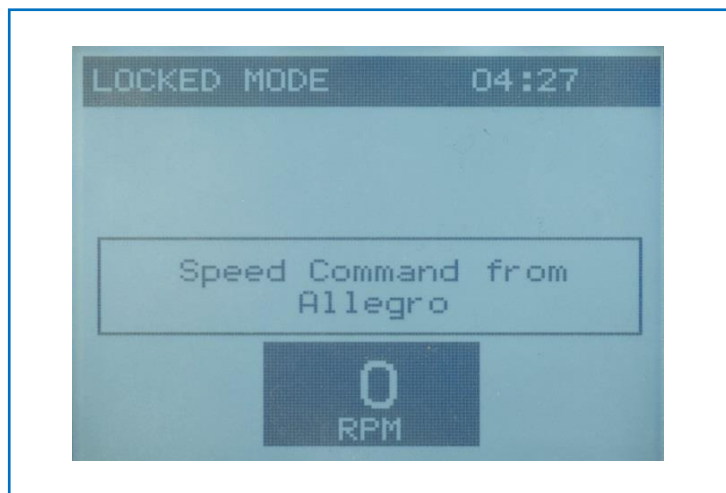
Basic locked mode screen shows 'LOCKED MODE' in status bar and exposes 'Speed Command from Allegro' (Figure 43), or the window for speed adjustment from local screen (Figure 44), depending on settings on remote panel. Speed of rotation is indicated on screen.



Access to locked mode of operation is available only for unit in charged condition, meaning successful completion of power up procedure and activation of 'READY' button.

Switching to locked mode of operation is blocked for drive unit being in Remote mode of operation, in any editor of settings or executing recipe run routine.

Figure 43 – Locked mode screen.



In locked mode of operation, the operator of remote-control panel can:

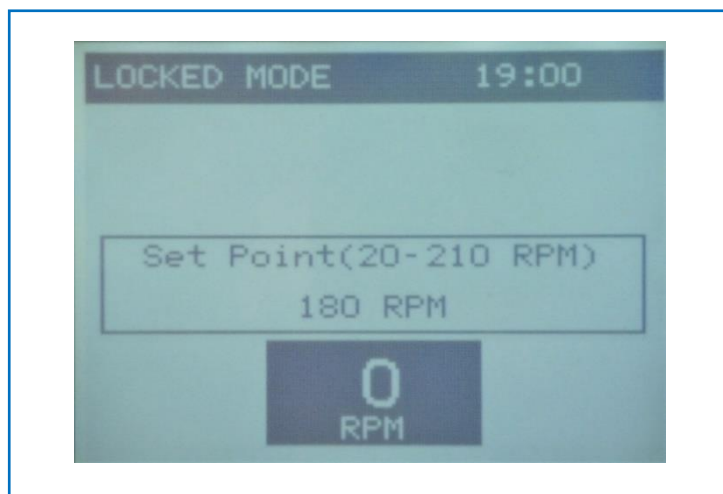
- Start / Stop the motor
- Change the speed of rotation
- Read the speed of rotation
- Switch full control to local panel and back
- Transfer speed adjustment function to local panel and back
- Read remote cable connection status

5.8.2 Local Operator Involvement

There are exceptions when a local operator is involved in interactions with the system running in locked mode of operation.

1. Per command from remote panel function of speed of rotation adjustment can be transferred to the local operator. In this case the window for local speed setup appears on locked mode screen (Figure 44). To adjust the speed of rotation, go to speed editor by pressing the speed setup window on screen or use quick adjustment keys on PLC front panel. Speed control can be taken back by operator of remote panel at any moment.

Figure 44 – *Local speed control in locked mode.*

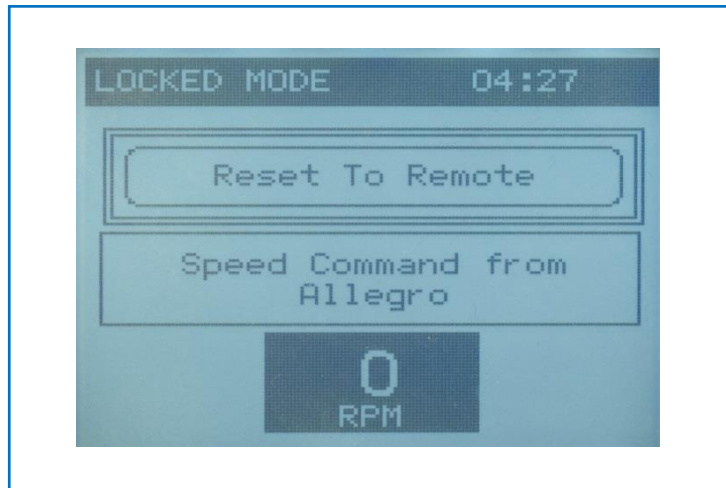


2. Full control of the drive unit can be transferred to the local panel and be taken back to remote panel per command of operator of remote panel.
3. Upon generation of alarm in unit running in locked mode, all controls as well as motor rotation are blocked. Standard alarm indication is present locally (Figure 46) while remote control panel doesn't receive alarm signal. Resolution of an accident is available only from the local panel.

- Another exception is 'Entry point' to locked mode – the condition when the drive unit being set to locked mode of operation experiences significant event which is power 'ON' or returning to operation after alarm reset.

At the entry point, a dedicated screen is displayed while all controls (local and remote) as well as motor rotation are blocked until local operator has pressed 'Reset to Remote' button. That action unblocks system control and causes it to function according to current settings on remote panel.

Figure 45 – Entry point reset.



5.9 Alarms

Failure detected by the system will activate 'Failure Mode' in the system being in any mode of operation. Failure mode causes the motor rotation to stop, displays an alarm notification to the operator and generates an alarm output signal for remote control. Alarm light changes the color from green to red and audible signal comes to beeping.

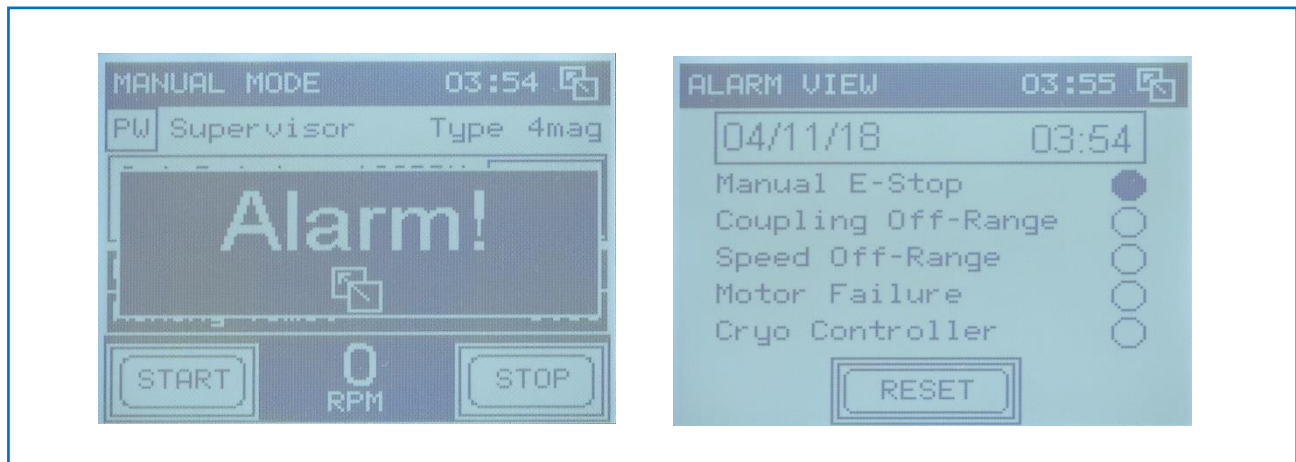
The equipment in the drive unit will stay powered up but cannot be operated until failure reset is complete. Alarm reset is available only from the LevMixer face panel. External control equipment will only receive an alarm signal with no ability to feedback control.



If a failure occurs while any of the editor screens are open, an alarm is generated but notification will not be visible on the touch screen until the operator escapes from the editor screen to normal operating screen.

In locked mode, the dedicated remote panel will not receive alarm status signal.

Figure 45 – Alarm screen (left), alarm view screen (right).



Reset of the failure mode is available from the alarm view screen which is opened after pressing the 'Alarm' button.

Upon alarm reset the system will return to one of the following:

- Manual mode, idle condition - if at the moment of alarm, the mixer is in remote mode or idled in manual mode.
- Manual mode, pause condition - if at the moment of alarm, the mixer is in manual mode run.
- Automatic mode, idle condition - if at the moment of alarm, the mixer is idled in automatic mode.
- Recipe run pause condition - if at the moment of alarm, the mixer is in recipe run.
- Power up mode - if a motor or cryo controller failure occurs in any mode of operation as they require power cycling for reset.

Five types of failure can stop the mixer operation:

1. **Manual E-Stop**

When an operator presses the 'E-Stop' button, motor rotation stops immediately and an alarm is generated. To reset the unit, follow the steps:

- Release the E-stop button by pulling it until it clicks.
- Press the 'ALARM' button on the touch screen to open the failure notification screen.
On the failure detection screen note blinking bullet against the Manual E-stop.
(The date and time of the failure event is indicated on this screen.)
- Press the 'RESET' button to return the unit to operating condition.

2. Coupling Off-Range

When the impeller is decoupled from the drive its speed of rotation deviates significantly from the speed of the motor. The alarm is generated when the system detects this deviation is outside of pre-determined tolerance. The operator should follow the steps:

- a) Press the 'ALARM' button to open the failure notification screen.
- b) On the failure detection screen note blinking bullet against the cryo controller.
(The date and time of the failure event is indicated on this screen.)
- c) Press the 'RESET' button to return the unit to operating condition.

3. Speed Off-Range

If the measured RPM deviates from speed set point is outside the ± 5 RPM limits for more than 60 seconds, the speed control may be functioning improperly. When this occurs, rotation is stopped and an alarm is generated. The operator should do the following steps:

- a) Press the ALARM button on the touch screen to open the failure notification screen.
- b) On the failure detection screen note blinking bullet against the Speed off-Range.
(The date and time of the failure event is indicated on this screen.)
- c) Press the RESET button to return the unit to operating condition.



The speed off-range alarm is not generated in remote or locked mode of operation. In this case current speed and set point are controlled externally.

4. Motor Failure

If the mixer's drive motor experiences an error, an alarm is generated. Motor rotation is stopped and the operator must perform the following steps:

- a) Press the 'ALARM' button on the touch screen to open the failure notification screen.
- b) On the failure detection screen note blinking bullet against the motor failure.
(The date and time of the failure event is indicated on this screen.)
- c) Press the 'RESET' button to return the unit to operating condition. The screen will open with a request to turn off the power to reset the failure alarm.
- d) Turn the unit off and back on.

5. Cryo-controller

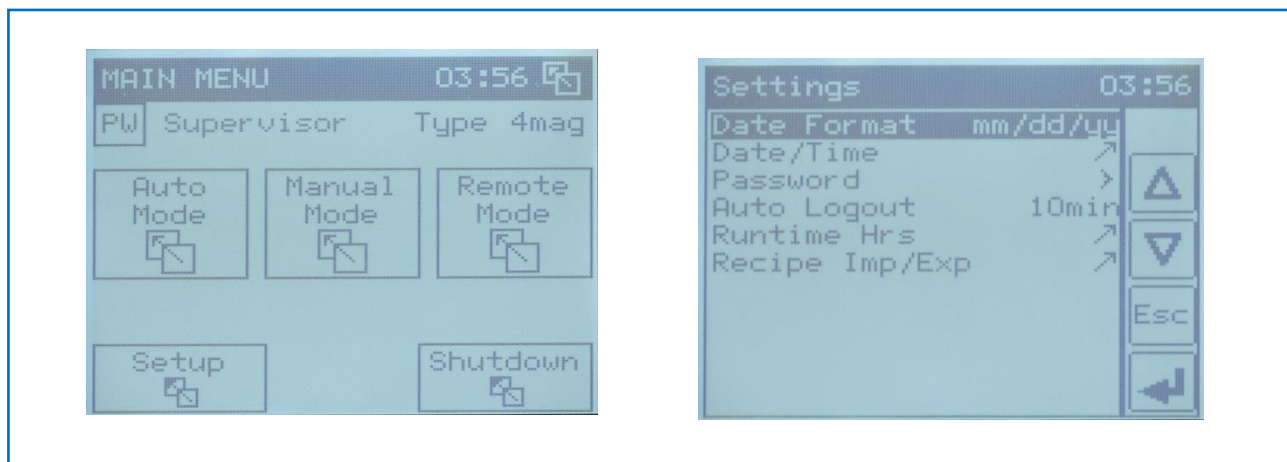
When the mixer's cryocooler experiences an error, it stops the impeller rotation and generates the alarm. The operator must perform the following steps:

- Press the 'ALARM' button on the touch screen to open the failure notification screen.
- On the failure detection screen note blinking bullet against the Cryo-Controller.
(The date and time of the failure event is indicated on this screen.)
- Press the 'RESET' button to return the unit to operating condition. The screen will open with a request to turn off power to reset the failure alarm.
- Turn the unit off and back on.

5.10 Auxiliary Functions




System functionality is controlled with parameters accessible through the setup editor which is available through the main menu screen. A setup button will appear on the screen after a user has logged in as a supervisor or maintenance level (**Error! Reference source not found.** Left). The selection of parameters available for adjustment depends on the level of access, and for the supervisor level it is listed in the settings editor (**Error! Reference source not found.** Right), which opens after pressing 'Setup'.

Figure 46 – Supervisor main menu screen (left), supervisor setting screen (right).



Supervisor settings allows:

- Select the date format for indication on screens, mm:dd:yy or dd:mm:yy
 - Login to system as supervisor
 - Press the setup button on the main menu screen
 - Select the 'Date Format' function using the up and down arrows
 - Press the curved arrow to go to the selection screen
 - Select the appropriate format using the arrows provided on screen and then press 'Enter'

2. Adjust the Calendar date and Clock time
 - Login to system as supervisor
 - Press the setup button on the main menu screen
 - Select the 'Date/Time' function using the up and down arrows
 - Press the curved arrow to go to the next screen
 - Press the button with the date, adjust the date to current, then press 'Enter'
 - Press button with the time, adjust time to current, then press 'Enter'
 - Press  to return to the settings list
3. Change password for Supervisor and Operator levels
 - Login to the system as supervisor
 - Press the setup button on the main menu screen
 - Select the 'Password' function using the up and down arrows
 - Choose the level of access to which the change of password is required
 - Press the curved arrow to go to the next screen
 - Press the curved arrow to go to the entry screen
 - Enter the new password twice as prompted and press 'Change'
 - Press  to return to the Settings list
4. Adjust auto logout time
 - Login to the system as supervisor
 - Press the setup button on the main menu screen
 - Select the 'Auto Logout' function using the up and down arrows
 - Press the curved arrow to go to the entry screen
 - Enter the time for auto logout then press 'Enter'
5. View runtime counter indicators for system runtime and motor runtime
 - Login to the system as supervisor
 - Press the setup button on the main menu screen
 - Select the 'Runtime Hrs' function using the up and down arrows
 - Press the curved arrow to go to the view screen
 - The screen will indicate accumulated runtime separately for both system and motor rotation
 - Press  to return to the settings list
6. Export of recipe library to memory card
 - Insert a SD card into the memory slot
 - Login to the system as supervisor
 - Press the setup button on the main menu screen
 - Select the 'Recipe Imp/Exp' function using the up and down arrows
 - Press the curved arrow to open the next screen


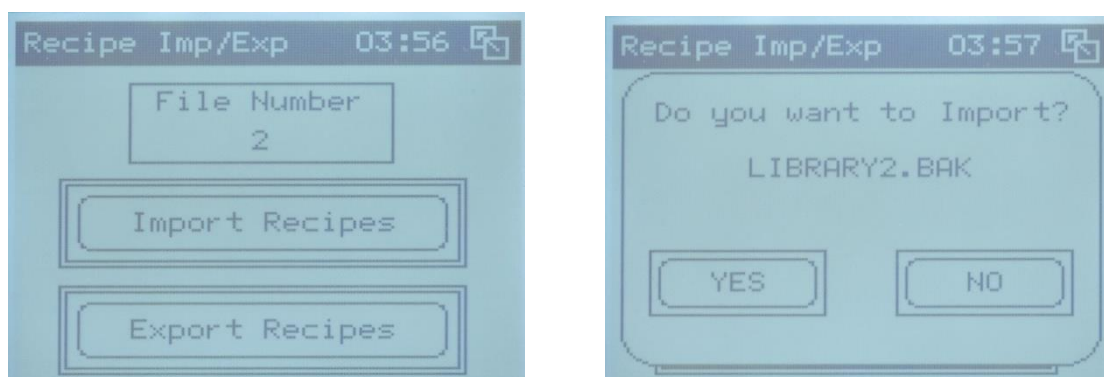

- Press the 'File number' button to go to the entry screen
- On the entry screen input the file number (0-9) you wish to export and press 'Enter'
- Press the 'Export recipes' button and confirm when prompted
- The entire library will be exported to the Micro SD card under filename LIBRARYX.BAK, where X is the file number entered at the previous step.
- A confirmation notice will appear after the file writing is finished (this may take several minutes)
- Acknowledge the notice and press  to return to the settings list

Figure 47 – Import / export screen (left), confirmation screen (right).



7. Import of recipe library from memory card

- Insert SD card into the memory slot
- Login to the system as supervisor
- Press the setup button on the main menu screen
- Select the 'Recipe Imp/Exp' function using the up and down arrows
- Press the curved arrow to open the next screen
- Press the 'File number' button to go to the entry screen
- On the entry screen input the file number (0-9) you wish to Import and press 'Enter'
- Press the 'Import recipes' button and confirm when prompted
- The whole library will be imported from the file on the Micro SD card named LIBRARYX.BAK, where X is the file number entered on the previous step.
- A confirmation notice will appear after the file writing is finished (this may take several minutes)
- Acknowledge the notice and press  to return to the settings list

5.11 Notifications Displayed after Mixing Run

Table 6 summarizes the messages displayed on the operator screen after the completion of mixing run being controlled from local panel.

Table 6 – *Finish notification details.*

Process Condition		Finish Notice Content	
Start	In-Process	Finished Status	Duration Shown
Manual permanent or timed run.	Normal process	Successful	Neat mixing time (pause time not included)
	Paused – resumed		
	Failure – alarm		
	Stopped (timed run only)	Unscheduled	
Recipe run.	Normal process	Successful	Actual duration of recipe run time (includes pauses)
	Paused – resumed		
	Failure – alarm		
	Aborted	Unscheduled	

5.12 Initial Settings

Default settings are the factory pre-installed parameters as listed in **Error! Reference source not found..** The parameters can be adjusted through the corresponding editor screens.

Table 7 – *Initial settings of user interface parameters.*

Description	Unit	Factory setting
Manual mode speed rotation	RPM	20
Manual mode run duration	Min	0
Recipe mixing phase time duration (in all instructions)	Min	0
Recipe pause phase time duration (in all instructions)	Min	0
Recipe speed of rotation (for all instructions in recipes)	RPM	20
Auto logout time	Min	10
Operator password		123456
Supervisor password		123456
Date format		MM:DD:YY
Calendar date		
Clock time		

6 Alarms and Trouble Shooting

6.1 General Alarm Information

Upon failure detection by the system, any processing is interrupted and the operator gets an 'ALARM' notification on the touch screen accompanied by audible alarm, red light on face panel and alarm status signal set in output to remote (not for ALLEGRO I/O). In this case, motor rotation stays blocked until alarm reset is complete. The latter is available only from the touch screen.

6.2 List of Alarms

The type of failure which caused the alarm can be seen through the alarm view screen. Total 5 alarms are detectable by system:

1. Manual E-stop. Generated when 'E-stop' button on face panel is pressed.
2. Coupling Off-Range. Generated by discrepancy between speed of motor and speed of impeller.
3. Speed Off-Range. Generated when speed of rotation deviates from set point.
4. Motor Failure. Generated by motor controller per internal criteria.
5. Cryo-Controller Failure. Generated by cryo-controller per internal criteria.

6.3 Troubleshooting

Error! Reference source not found. lists ways for resolving possible problems. Contact technical service if problem persists.

Table 8 – Troubleshooting.

Description	Possible Reason	Corrective Action
Unit does not start when power button is pressed.	Main power fuse is burned out.	Contact service personnel.
No white light when power is on while unit started.	Power button LED is burned out.	Contact service personnel.
Excessive wobbling of levitated impeller during use.	Unit improperly charged.	Power off the unit. Wait 25 min or more and charge the unit again.
	Misalignment of charger position during charging.	Inspect the top surface of levitation head for levelness. Inspect the charger for mechanical damage.
	Charger magnet damaged.	Recharge the unit with another charger and perform the levitation test.
	Cryomodule malfunction.	Call for technical service.
Impeller doesn't levitate correctly after charging complete.	Unit improperly charged.	Power off the unit. Wait 25 min or more and charge the unit again.
	Power cord is unplugged from the unit.	Ensure the power cord is properly attached to the unit.
	Cryomodule malfunction.	Call for technical service.
	Cryocooler controller malfunction.	Call for technical service.
Being started in cold condition of superconductors (after short term power off) unit creates excessive noise.	No malfunction.	This condition is temporary and is considered normal. Noise will disappear within 15 mins of operation after a cold start. No action required.
Unsmooth rotation of Impeller in fluid with jerking movements, accompanied by knocking noise and possibly with impeller jumps up-down.	Coupling is out of specification.	Recharge the unit.
	Loose timing belt.	Call for technical service.
	Impeller is overloaded with torque.	Inspect impeller load in application, reduce load if possible.

7 Cleaning and Maintenance

The LevMixer Drive Unit is designed to operate with minimal maintenance. It has been tested to run continuously for up to 45 days. Longer operation may be possible but further user validation would be required. However, to minimize wear it is recommended that the drive be unplugged if it is not in use for more than 24 hours.

7.1 General Warnings



- *Always unplug the unit from power line when performing maintenance procedures. When finished, make sure all the electrical cases are properly locked and all open / detached components placed back and secured in their normal position.*
- *Update / restore of software resets the runtime counters to zero.*
- *Update / restore of software results in changes in recipes content which is set to factory installed values (run time and pause time are zero, speed = 20 RPM).*

- Only use the original packaging for shipment of the drive unit.
- Start-Up: When the unit is started with cold superconductors (short term power off), excessive noise and vibration are possible within first 15 min of operation. This is normal and is not considered a malfunction.
- Recipes can be transferred between LevMixer units, including the whole recipe library, using external media (micro SD card).
- If user defined library content needs to be transferred back in the unit after service is done it is recommended to save the recipe library on a micro SD card prior to conducting software service.

7.2 Hardware Cleaning

To clean, wipe down the drive unit surfaces using water and a mild detergent solution. Standard drives are constructed from 304 alloy stainless steel, which may be vulnerable to corrosion if exposed to corrosive chemicals, or if left in persistent contact with moisture. Appropriate precautions should be taken to prevent such corrosion.

7.3 Maintenance Procedures

7.3.1 Sensor Ring Replacement

If replacement of sensor ring (Figure 48) is required, perform the following steps:

1. Unlock the cable clamps on the frame and release the sensor ring cable.
2. Unscrew and unplug the sensor ring connector from the rear panel of the control box.
3. Slip the sensor ring up and off the levitator head.
4. Put the replacement sensor ring over the levitator head.
5. Connect the sensor ring connector to the rear panel of control box.
6. Place the sensor cable in the cable clips on the frame and lock them.

Figure 48 – *Sensor ring replacement.*



7.3.2 Power Cord Replacement

Should you need to replace the power cord with an alternative one with a different type of plug, follow the procedure as described below. Changing the power cord is performed through a power entry connector on the back panel of the Control Box.

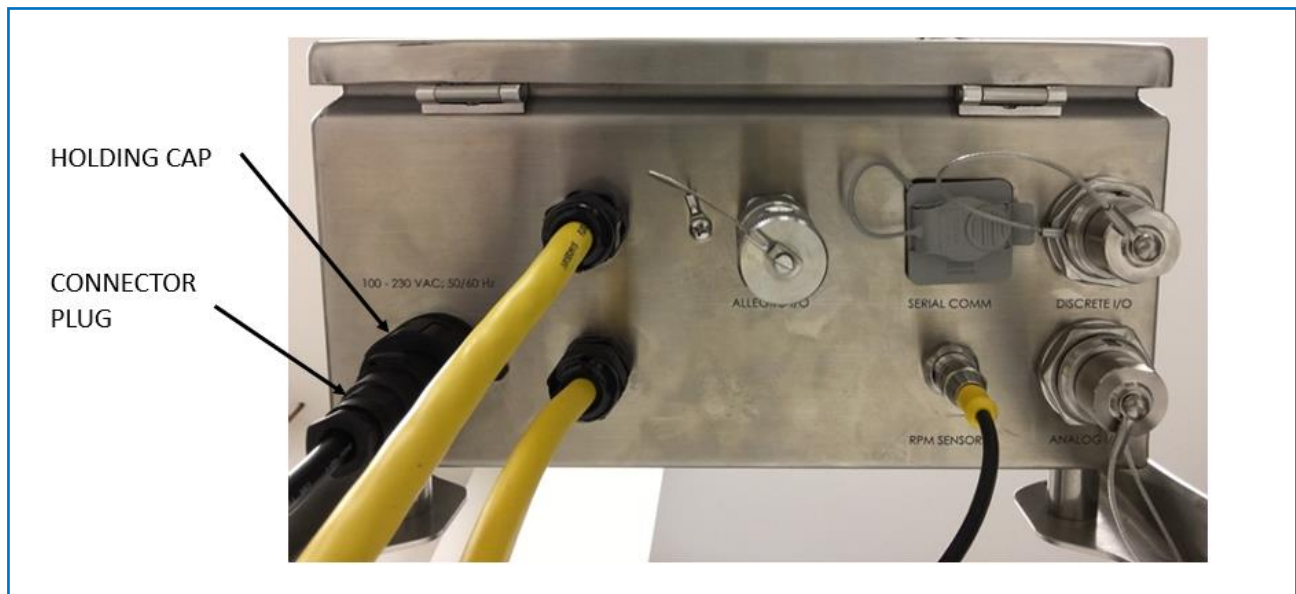
To replace the power cord, follow these steps (Figure 49):

1. Ensure the unit is turned off.
2. Unplug the unit from the external power supply.
3. Disconnect the power cord from the control box by rotating the power connector holding cap counter clockwise then, holding the connector plug, pull it out of the receptacle.
4. Attach the replacement power cord connector plug to the power receptacle on the control box. Make sure the key on the receptacle and key hole in the plug are aligned and the connector plug is pushed all the way in.
5. Secure the connector holding cap by rotating it clockwise. Tighten the cap firmly to seal the connection.



Only use power cords provided by Pall for replacement.

Figure 49 – Power cord replacement.



7.3.3 Micro SD Card Replacement

Micro SD cards are compatible with the memory slot. The PLC uses a FAT 32 file system format. The memory slot is equipped with a 'push-in, push-out' connector for Micro SD cards insertion.

To change the SD card:

1. Switch the unit off and unplug it from the external power source.
2. Unlock control box by rotating the latch counter clockwise using a flat-head screwdriver.
3. Open the Control Box door and locate the memory slot on the upper side of the PLC (Figure 50).

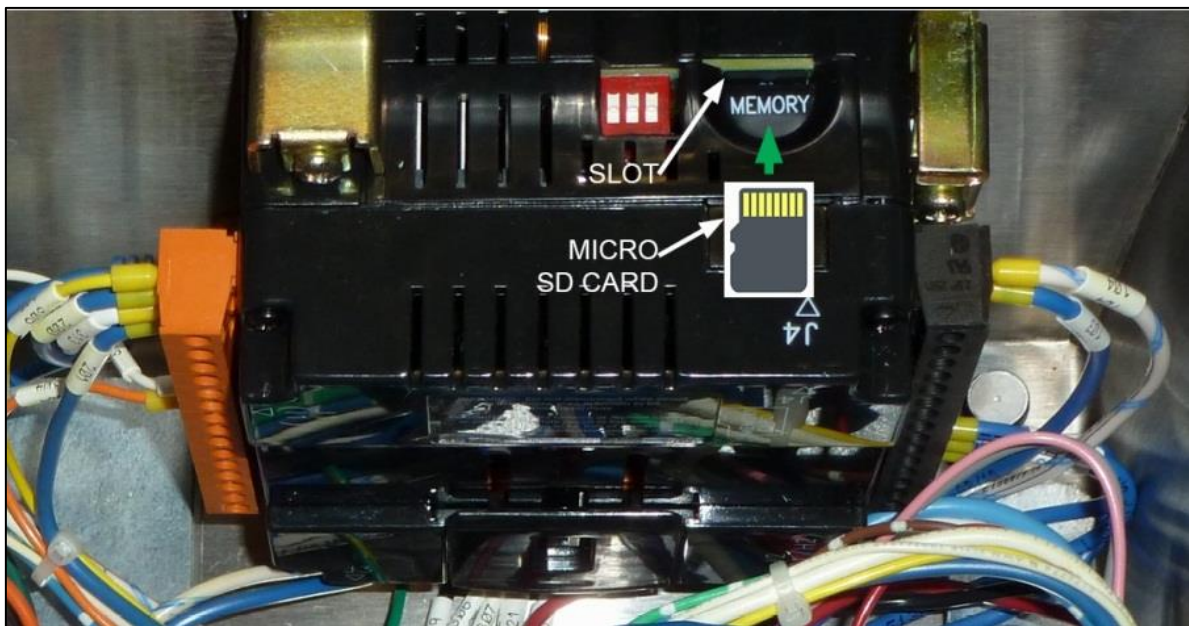
To insert the SD card:

1. Align the card so that the 8-pin gold edge connector is facing upwards on the SD card.
2. Push the micro SD card in all the way into the memory slot, ensuring that it clicks into place.

To remove the Micro SD card:

1. Push down on the top of the card gently to release the spring. The card will pop up for removal.
2. Close the control box door and lock it by rotating the latch 90° in a clockwise direction using a flat-head screwdriver.

Figure 50 – Micro SD card installation.



7.3.4 Fuse Replacement

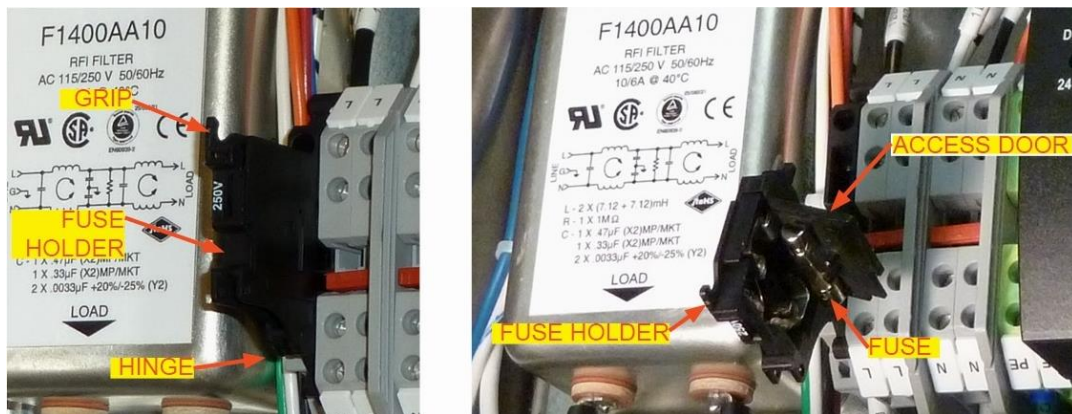
To change the fuse, follow the below steps (Figure 51):

1. Switch the unit off and unplug it from the external power source.
2. Unlock control box by rotating the latch counter clockwise using a flat-head screwdriver.
3. Open the control box door and locate the fuse holder.
4. Grip the fuse holder, pull upwards and rotate it 90°.
5. Unsnap and open the access door on the side of the fuse holder. The fuse will now be exposed.
6. Remove and replace the fuse by pulling the old one out and snapping the new one into the slot on the access door surface.
7. Close the access door and squeeze firmly to snap it back in place.
8. Rotate the fuse holder back into its original position.
9. Close the Control Box door and lock it by rotating the latch clockwise using a flat-head screwdriver.



Reference the label on the internal surface of the control box door for correct type of replacement fuse.

Figure 51 – Fuse replacement.



7.3.5 LED Bulb Replacement

To change the LED bulb, follow the below steps (Figure 52):

1. Switch the unit off and unplug it from the external power source.
2. Unlock control box by rotating the latch counter clockwise using a flat-head screwdriver.
3. Open the control box door and locate the contact block attached to the power button.
4. Pull the cap up from the lever (pry slightly with slotted blade screw driver).
5. Turn the lever to the left position.
6. Pull the contact block off the power button. The contact block will release and the LED will be exposed.
7. Replace the LED by twisting and pulling it out of the contact block. Replace with a new LED.
8. Place the contact block in its original position on the power button stem and lock it by turning the lever all the way to the right.
9. Check to ensure the contact block is firmly seated on the power button and place cap back on the lever all the way down.
10. Close the control box door and lock it by rotating the latch clockwise using a flat-head screwdriver.

Figure 52 - *Contact block release (left), LED bulb replacement (right).*

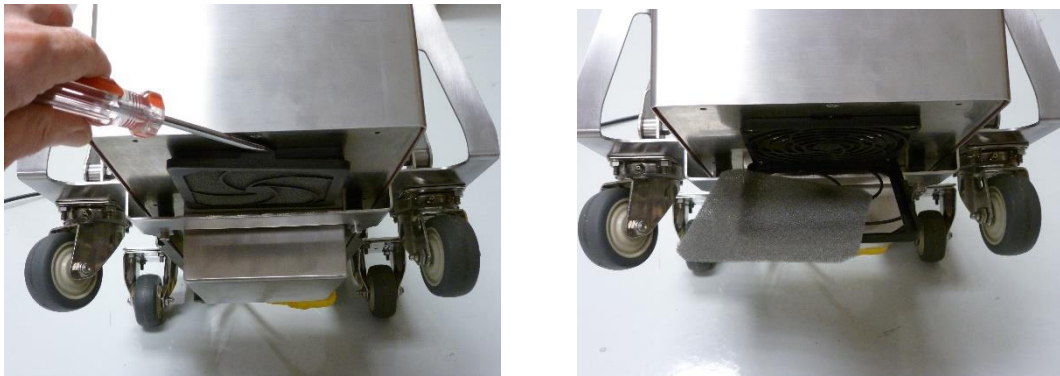


7.3.6 Air Filter Inspection

To inspect air filter, follow the steps below:

1. Switch the unit off and unplug it from the external power source.
2. Lean the entire unit back to expose the bottom of the unit.
3. Unsnap all four clips of the filter cover with a flat-head screwdriver and detach it from the filter body.
4. Remove the cover by sliding it out. The filter tissue is located between the filter body and filter cover (Figure 53).
5. Check the filter tissue for deposits on both sides. Replace filter tissue with a new one if noticeable deposits are found.
6. Replace the filter tissue and snap the filter cover back onto the filter body.
7. Check to ensure the cover is secured using all four clips.

Figure 53 – Removing filter cover (left), replacing filter membrane (right).



7.3.7 Speed Calibration Verification

Equipment recommended:

- Test Impeller: Accessory item LT-SVSP310 or LT-SVSP311 equipped with piece of reflective tape (tachometer accessory) on side surface.
- Optical Tachometer: Omega HHT13 or equivalent



UNIT CONDITION: Charge properly and have corresponding impeller coupled above the drive head. Choose the manual mode of operation.

1. Set the permanent run speed of rotation to 20 RPM.
2. Press and hold the 'Start' button until the progress bar at the top of the touch screen indicates the operation is complete (takes 2-3 sec). Ensure impeller rotation is started. Wait until the impeller accelerates to its nominal speed of rotation.
3. Reading from external tachometer write into the second column of Table 9
4. Calculate and write down in the third column the difference between set point and measured in speed value.
5. Compare the reading recorded in column 2 with corresponding allowable range in the third column of table 4, then record the result in column 6.
6. RPM reading from panel screen record into the fourth column of table 9.
7. Compare the reading recorded in column 4 with corresponding allowable range in the column 5 of table 9 then record the result in column 7.

Repeat steps 2 to 7 for each of the RPM set points in the first column of **Error! Reference source not found..** If unsuccessful, contact Pall service team.

Table 9 – Rotational speed calibration test measurements.

1	2	3	4	5	6	7
Set Point (RPM)	External Tachometer Reading (RPM)	External Tachometer Reading Allowable Range (RPM)	Panel Tachometer Reading (RPM)	Panel Reading Allowable Range (RPM)	External Tachometer Max Deviation Falls within allowable Range (Y / N)	Panel Tachometer Max Deviation Falls Within Allowable Range (Y / N)
20		19 - 21		19 - 21		
40		39 – 41		39 – 41		
60		59 – 61		59 – 61		
80		79 – 81		79 – 81		
100		99 – 101		98 – 102		
120		119 – 121		118 – 122		
140		139 – 141		137 – 143		
160		159 – 161		157 – 163		
180		179 – 181		176 – 184		
200		199 – 201		196 – 204		
210		209 - 211		206 - 214		

Calibration verification is successful if all the rows in columns 6 and 7 of Table 4 have result Y.

7.4 Hardware Preventative Maintenance

Periodical maintenance is recommended to keep the drive unit in reliable working condition. Wearing of moving parts can be monitored through the elapsed run time counter in the PLC. Run time information is accessible for viewing on the touch screen through the setup menu (chapter **Error! Reference source not found.**).

Table 10 – Preventative maintenance actions.

Description	Frequency	Spare Parts Involved	Who Performs?
Filter Inspection. Replace if deposit on the filter media are noticeable.	Every 1000 system run hours.	Replacement filter tissue LT-SVSP327.	User. Follow procedure description in this manual.
Timing belt replacement.	Every 9000 motor hours.	Timing belt LT-SVSP330.	Service
Battery replacement.	6 years.	Li battery.	Service.

7.5 Service

The Mixing system was developed exclusively for mixing fluids and solids in fluids in specially designed biocontainers. The machine should only be used for this purpose to ensure a long service life.

7.5.1 Warranty

Pall warrants that the Allegro systems manufactured by Pall, when properly stored and installed, and operated as per the specifications and design conditions stated in this document will be free from defects in material and workmanship during their shelf life. Pall liability under any warranty is limited solely to replacing, or issuing credit for the Allegro systems that may become defective during the warranty period.

7.5.2 Pall Service

Pall Corporation offers a comprehensive range of services that provide a convenient and reliable way to assure instrument operation and minimal downtime. Our team – all certified Field Service Professionals – provide robust, accurate, agile responses, born of our heritage in filtration instrumentation and an uncompromising knowledge of our customers' unique worlds. We hold the strong belief that Service is a benefit to your processes, not merely a way to maintain them.

To schedule service request or to get a quote for repair service, please visit the web address below and submit your request. <https://www.pall.com/en/instrument-service-support.html>

You may also submit service requests at the email address service@pall.com

7.6 End of Life Disposal



The presence of this WEEE label on a product means that the product contains electrical or electronic materials and therefore must not be disposed of as unsorted waste, but instead is treated separately. The presence of these materials may, if not disposed of properly, have potential adverse effects on the environment and human health. Within the EU, operators are urged to recycle such products when being replaced with a newer version or when they have outlived their useful lives.

Under the Waste Electrical and Electronic Equipment (WEEE) Directive and implementing regulations, when customers buy new electrical and electronic equipment from Pall they are entitled to:

- Send old items put on the market in Europe before August 13th 2005 equipment for recycling on a one-for-one, like-for-like basis (this varies depending on the country)
- Send the new equipment back for recycling when this ultimately becomes waste.

Country specific instructions to both customers, and recyclers/treatment facilities wishing to obtain disassembly information, are provided by following the link below.

<https://www.pall.com/en/about-pall/corporate-sustainability/weee-compliance.html>

8 Detailed Specification

8.1 Hardware Technical Specification Summary

Table 12 – Specifications

Description	Specification
	40 x 112 x 91 cm (16 x 44 x 36 in) - compact configuration.
Footprint W x L x H	40 x 131 x 91 cm (16 x 51.6 x 36 in) - expanded configuration.
Control box, cart, & mixer enclosure material	304 L stainless steel.
Control box, cart, & mixer enclosure surface finish	Less than or equal to 47 µin. Ra / 1.2 µm Ra.
Control box ingress rating	IP 65.
Enclosure ingress rating	IP 23.
Voltage	100-230VAC, 50/60Hz.
Input wattage	Less than 350 W.
Amperage	100 V 2.8 A; 110 V 2.5 A; 230 V 1.5 A.
Voltage fluctuation	+/- 10%.
Altitude rating	1000 m.
Max humidity	85%, avoid condensation.
Ambient temperature	4-40°C.
Motor horsepower	1/8 hp.

Power cord length	600 cm (20 ft).
Power cord plug options	US, Continental Europe, Swiss, Australia, Japan, UK.
E-stop (present, yes / no, location)	Yes, face of control box.
Min and max speed	20 to 210 RPM. TURCK RSFPV61, RSFPV579 HUMMEL M23 male thread, 12-pin.
Connections for remote output / control	Cord sets for remote control are not supplied.
Functions available from remote control panel	Motor - start, stop. Speed – adjustment, indication. Alarm – indication. Mode of control (remote / local) – indication.
Signal type(s) for remote output / control	Impeller speed out 4-10 mA, motor control in 0-10 VDC, discrete I/O signals relay contact type.
Alarms generated	Motor failure, impeller coupling failure, speed off-range failure, cryocooler failure, E-stop activation.
Mixer charge time	35 minutes.
Operator interface type	Touchscreen PLC.
Method for RPM measurement	Direct measurement of impeller speed via non-contact magnetic sensor.
Noise level at operator position	67 dB.
Casters	2 swivel (front), 2 stationary (rear).
Wheel material:	Polyurethane.
Recipe storage:	Up to 10 can be stored. Up to ten instructions in each recipe are executed sequentially. Each instruction contains individual programmable parameters: mixing time, pause time, and speed.
Password protection:	Operator: Access to protected function - start recipe run. Supervisor: Access to protected functions - recipe Editor, pause or abort recipe run, switch of control between local to remote, adjustment of set up for reduced set of parameters. Maintenance: Access to protected functions – program setup parameters, system parameters and includes supervisor level of access.

Figure 54 – Electrical diagram. Control box.



The diagram illustrates the electrical connections for the CRYO-CONTROLLER. It features a central control unit with multiple connectors and power supplies.

- TERMINATING PLUG:** A 5-pin connector with pins 1, 2, 3, 4, and 5.
- POWER CONNECTOR:** A 12-pin connector with pins 1 through 12.
- SIGNAL CONNECTOR:** A 12-pin connector with pins 1 through 12.
- CRYO-CONTROLLER:** The central control unit with connectors J4, J6, and J8.
- PS 48VDC 320W:** A power supply unit with terminals Z, L, and GND.
- PS 24VDC 250W:** A power supply unit with terminals Z, L, and GND.
- FAN:** A cooling fan connected to the 48VDC power supply.
- MOTOR:** A motor connected to the 24VDC power supply.
- CRYOMODULE:** A cryogenic module connected to the CRYO-CONTROLLER.

The diagram shows the following connections:

- CRYO-CONTROLLER J4:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J6:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J8:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J9:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J10:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J11:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J12:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J13:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J14:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J15:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J16:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J17:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J18:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J19:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J20:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J21:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J22:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J23:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J24:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J25:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J26:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J27:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J28:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J29:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J30:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J31:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J32:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J33:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J34:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J35:**
 - Pin (2) to PS 48VDC 320W Z
 - Pin (10) to PS 48VDC 320W L
 - Pin (10) to PS 24VDC 250W Z
 - Pin (10) to PS 24VDC 250W L
- CRYO-CONTROLLER J36:**
 - Pin (2) to PS 48VDC 320W Z
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Table 13 – Remote control I/O chart.

Analogue I/O Connector Circuits

Pin No.	Description	Range	Calibration	
2, 3	Speed output 4-20 mA	0-210 RPM	4 mA = 0 % of range	20 mA = 100 % of range
4, 5	Speed set point input 0-10 VDC	0-201 RPM	0 V – 0 % of range	10 V = 100 % of range

Discreet I/O Connector Circuits

Pin No.	Description	Range	Calibration	
1, 2	Motor start / stop input	Relay contact	Open = stop	Closed = run
3, 4	Remote status output	Relay contact	Open = local control	Closed = remote control
5, 6	Alarm output	Relay contact	Open = no alarm	Closed = alarm

Allegro I/O Connector Circuits

Pin No.	Description	Range	Calibration	
1, 3	Motor start / stop input	Relay contact	Open = stop	Closed = run
5, 3	Normal / locked mode switch input	Relay contact	Open = locked mode	Closed – normal mode
2, 4	Speed control switch input	Relay contact	Open = local speed adjustment	Closed = Remote speed control

The analogue speed control input 0-10 V (pins 4 and 5 of analogue I/O connector) has an impedance of 500 kOhm. The safe input voltage range is -0.5 V to + 15 V.

For the analogue output 4-20 mA (pins 2 - 3 of analogue I/O connector and pins 11 – 12 of Allegro I/O connector) the maximum load resistance should not exceed 500 Ohm.

For equipment safety and to avoid possible excess noise on the speed control input signal (pins 4, 5 of analogue I/O connector) it is recommended to include an isolation amplifier in the design of the 0-10 VDC remote control external circuitry.

Avoid having in use simultaneously remote cable in Allegro connector and standard remote cables (discrete and analogue connectors) to prevent potential interference of some of I/O signals.

External connectors and cables are rated 300 V to 600 V. For all external communication signals normally working voltage does not exceed 24 V by design.



External equipment intended for connection to signal inputs, signal outputs or other connectors shall comply with the relevant product standard e.g. IEC 60950-1 or IEC 62368-1 for IT-equipment and the IEC 61010-1-series for laboratory equipment to provide proper isolation between high voltage and low voltage circuits.

9 Appendix A: Declaration of CE Conformity

CONTROLLED DOCUMENT

R D LS QF 001 Rev 0 (DIV CO - 23539)

DECLARATION OF CONFORMITY



EC DECLARATION OF CONFORMITY



Product Description: Levmixer® Drive Unit

Product Part Number: LMG403

The LevMixer®
a product of Pall Corporation, is in conformity with the requirements of the following European Directives
(and their associated amendments):

Electromagnetic Compatibility Directive (EMC)	2014/30/EU
Electrical Safety Low Voltage Directive (LVD)	2014/35/EU
Restrictions on the use of Certain Hazardous Substances (RoHS)	2011/65/EU
Machinery Directive	2006/42/EC

This declaration is based upon testing the compliance of the product against the limits of the following harmonised standards:

EN60204-1: 2016	Machinery Directive
EN61010-1: 2012	Low Voltage Directive
EN61000-6-4:2007 (EN55011:2016), EN61000-6-2:2005	EMC Directive

Signed:

Paul Wallace
Quality Manager, Westborough

Date:

For and on behalf of:
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