

Pump Settings

Rate: The rate of the pump

Diastolic Pressure: The pump's suction pressure (Usually -20 to -40 mmHg)



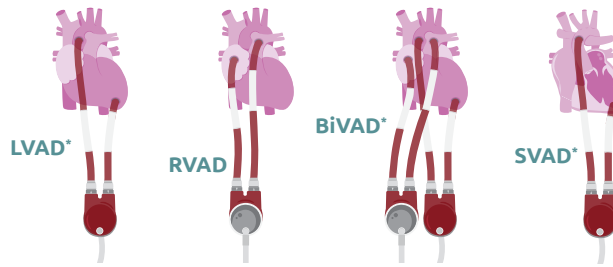
Systolic Pressure: The pump's ejection pressure (Averages: LVAD=180–250 mmHg, RVAD= 80–150 mmHg)

% Systole: Time the pump spends ejecting blood (Usually >30% and <50%)

$$\text{Estimated Cardiac Index}^* = \frac{\text{Pump Rate} \times \text{Pump Size}}{\text{BSA} \times 1,000}$$

*Assume complete fill and eject

Cannulation Strategies

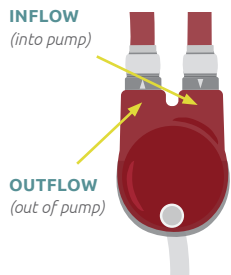


*Inflow cannula could implant into the ventricle or atrium

Optimizing Pump Function

	CAUSES	CVP (Central Venous Pressure)	C.O. (Cardiac Output)	Patient Treatments	PUMP FIXES
POOR FILL	Hypovolemia Inflow Cannula Obstruction Tamponade Right Heart Failure	↓ ↑ ↑ ↑	↓ ↓ ↓ ↓	Give Fluid Evaluate Further Surgical Drainage +/- Nitric Oxide & Inotropes	Decrease Rate Increase Diastolic Pressure Decrease % Systole
POOR EJECT	Hypertension Outflow Cannula Obstruction Agitation	↑ ↑ ↑	↓ ↓ ↓	Reduce Afterload Evaluate Further Pain Control/Sedation	Increase Systolic Pressure Increase % Systole

Blood Pump

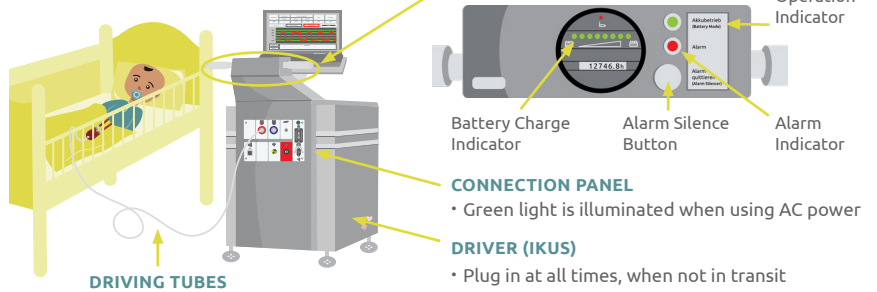


Blood pump moves in two phases:

Fill (diastole): Negative pressure pulls blood from inflow cannula. Membrane moves towards the air chamber side and blood chamber side fills (Normal filling is considered >75% fill)

Eject (systole): Positive pressure pushes membrane towards the blood chamber side and blood ejects out the outflow cannula (Normal eject is considered =100% ejection)

System Components



Power Sources

General Power Sources:



Batteries: Last only 30 minutes



Electrical Power Outlet: IKUS should be plugged in at all times, when not in transit

Emergency Power Source:



Manual Pump: Pump at a speed of 60–80 BPM (per IFU)

Pump Assessment

Notify VAD care team and document any CLOT or FIBRIN

To evaluate for clot or fibrin:

- Follow blood path with a flashlight and a mirror
- Look closely around the valves

Types of defects:

- Fibrin: White, usually small
- Thrombus: Dark in color
- Concerning if:**
 - Increasing in size >5mm
 - Quick increase in amount of clot
 - Becoming darker
 - Mobile

Anticoagulation

- Bivalirudin IV within 24 hr with goal of PTT 60–100 depending on risk factors/care site preference
- Aspirin POD 1–2, uptitrate to either functional testing or use care site dose/kg goals
- Use of other anticoagulants/antiplatelets is determined by the VAD care team



Blood Pressure

- Patient will have a palpable pulse at the set pump rate
- Adequate blood pressure control is necessary for pump eject

Fluid Status

- Determine optimal fluid status by following patient exam and pump fill

Alarms

Notify VAD care team of alarms

Common Alarm: (Alarms may need to be cleared by logging in)

- Please Check Left/Right Pump and Driving Tube:** Improper flow has been detected, often caused by a kink in a cannula. Change position of cannula to resolve alarm.

Potential Emergencies

Power Failure: (Manual Pump)

- Switch driving tubes from the IKUS to the manual pump according to the color code
- Operate manual pump rhythmically with approximately 60–80 BPM
- Make sure membrane is moving completely

CPR: Chest compressions and defibrillation/cardioversion can be used if needed

Membrane Rupture

- Watch for change in membrane movement on air or blood side
- Watch for a dark area or air bubbles on the blood side
- Watch for hemodynamic changes or heart failure signs and symptoms
- Treat heart failure
- Perform emergency pump exchange

For [Berlin Heart Algorithms & Emergency Care](#), scan the QR code for more resources

