

7. Flow Boiling Rig

- Purpose: This setup enables the determination of the convective heat transfer coefficient (h) during flow boiling of refrigerants as well as the flow regimes during boiling. The primary aim of this project is to demonstrate improved heat transfer characteristics on etched surfaces.
- Pump/Motor: The refrigerant will be circulated using a GC series pump with M25 gear set (Micropump Inc.) coupled with a 0.33 HP TENV motor (Baldor Inc.). A VS1ST series variable frequency drive, VFD (Baldor Inc.) will be used to control motor rpm for controlling the mass flow rate of refrigerant in the closed loop.
- Flow meter: A Coriolis effect flow sensor is used to measure the mass flow rate of refrigerant.
- Test Section: The test section will comprise smooth as well as etched copper tubes of varying dimensions. Thermocouples will be attached along the test section using thermal epoxy.
- Evaporator: The test section along with the heat source is used as an evaporator in the closed loop.
- Pre-heating section: A configuration similar to that of the test section is used as the pre-heating section upstream of the test section.
- Condenser: A B17 brazed plate heat exchanger (SWEP Inc.) with ten plates will be used as the condenser in the loop. Heat is exchanged with an Ethylene Glycol/ Water solution supplied by a chiller system.
- Receiver: A sample cylinder (Swagelok), one liter in volume, is used as a receiver in the closed loop.
- Operation: Heat transfer experiments will be conducted at varying mass flux and heat flux values. Mass flux and heat flux will be controlled using the frequency input to the gear pump unit and the voltage input to the DC power supply, respectively.

