



SINGLE-USE HEAT EXCHANGER

The DHX System from ASI is a modular heat exchanger system that uses single-use bags as the sterile fluid path. The bags fit tightly between five stainless steel plates, efficiently transferring heat in a counter-current flow path. The system provides efficient, sterile heat transfer that easily integrates into any process.

DHX SINGLE-USE BAGS

Single-use bags in the heat transfer process ensure a closed and sterile fluid path, eliminate the risk of cross contamination and greatly reduce turnaround time between batches.

Each bag fits tightly between the stainless steel plates and the process fluid, in the single-use bags, flows counter-currently to the heating / cooling fluid in the plates. This method of heat transfer is superior to traditional jacketed systems and the modular footprint allows for use in multiple process locations.

BENEFITS OF THE DHX SINGLE-USE HEAT EXCHANGER

- Completely Isolated Flow Paths for Process Fluid and Heat Transfer Fluid
- Counter-current, Serpentine Flow Patterns
- Dimpled Jacketing on the Plates to Ensure Turbulent Flow
- Bags Fill in Place with no Operator Interaction
- Modular Design and Small Overall Footprint Allows for Changing Process Needs
- Reduced Infrastructure Requirements
- Reduced Processing Time
- Improved Product Consistency

AREAS OF APPLICATION

- cGMP commercial and clinical bio-therapeutics, vaccines and other biologic processes.
- Upstream applications include: media hold, fermentation, cell separation / protein harvest, harvest cooling and harvest hold.
- Downstream applications include: harvest hold, buffers, protein purification, and bulk drug substance.

*DHX Disposable Heat Exchanger from ASI is Patent-Pending



Efficient Heat Transfer

Counter Current Flow Between the Heating / Cooling Fluid and the Process Fluid

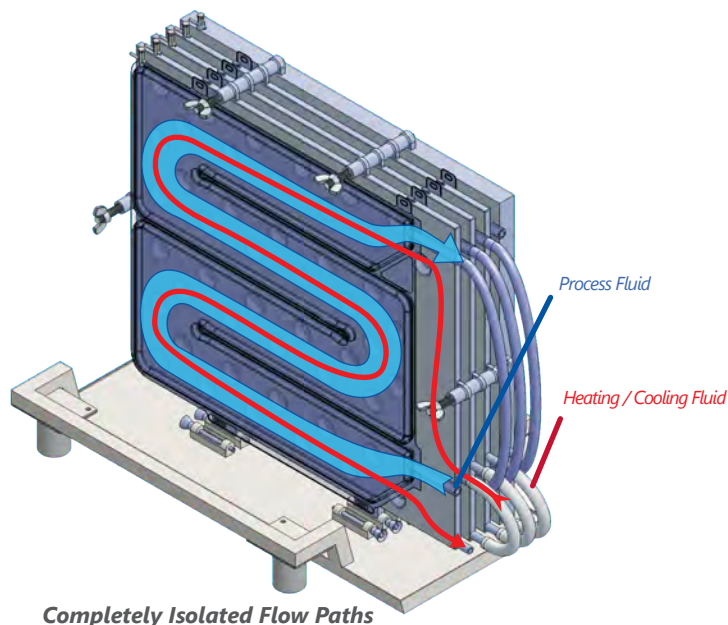
The purple shading depicts the serpentine flow path of the process fluid in the bags. The dimpled plate behind the single-use bag depicts where the heating / cooling fluid flows counter-currently to the process fluid in a completely isolated flow path.

Technical Specifications

- Effective Heat Transfer Area: Up to 27 Sq. Ft.
- Overall Dimensions: 20" W x 29" D x 27" H
- Number of Plates: 5
- Number of Bags: Up to 4
- Dry Weight: 150 Kg
- Full Weight (Includes 4 Single-Use Bag Assemblies): 190 Kg

DHX Plate System

- Material of Construction: 304 L Stainless Steel
- Pressure / Temperature Rating: FV/150 PSIG at 150°F
- Pressure Vessel Code: ASME Ü-1
- Connections: 1/2" Compression



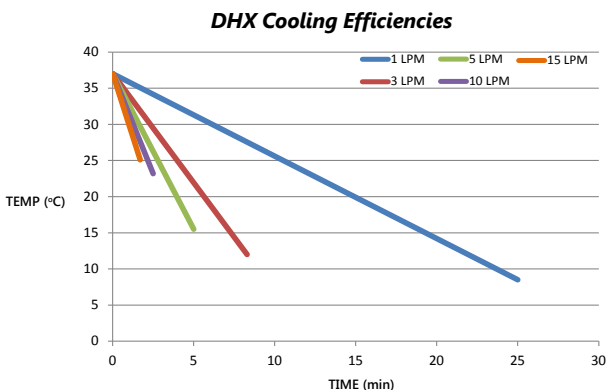
DHX Single-Use Bag Assembly

- Single-Use Bag Material of Construction: Low Density Polyethylene
- Interconnecting Tubing: C-Flex
- Pressure / Temperature Rating (installed in DHX Plate System): 20 PSIG at 122°F (50°C)
- Connections: GE ReadyMate™ DAC 500 as standard – Custom connections upon request
- Flow Rate Capacity: Up to 15 Liters per Minute (LPM)

HEAT TRANSFER EFFICIENCIES FOR TYPICAL APPLICATIONS - SINGLE PASS

Cooling from 37°C – Single Pass

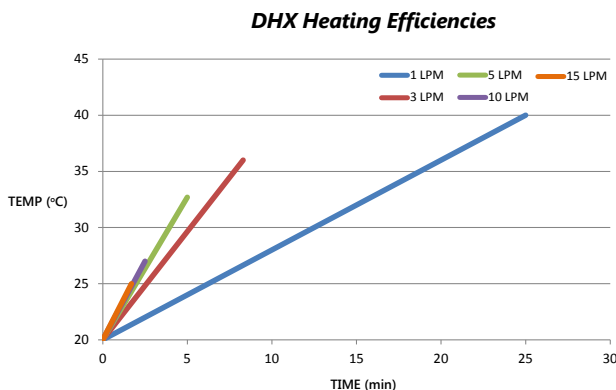
- Process Fluid: Water at 37°C
- Heat Transfer Fluid: 30% Propylene Glycol at 2°C
- Heat Transfer Flow Rate: 15 LPM
- Number of Bags: 4



DHX Cooling Efficiencies Measured by Temperature vs. Time

Heating from Ambient Temperature – Single Pass

- Process Fluid: Water at 20°C
- Heat Transfer Fluid: 30% Propylene Glycol at 42°C
- Heat Transfer Flow Rate: 15 LPM
- Number of Bags: 4



DHX Heating Efficiencies Measured by Temperature vs. Time