Full Range of HVAC&R Line Products

# Economiser Heat Exchangers

## Introduction

A Dry All Economiser Heat Exchanger (DAEX Series) is a specialized Heat Exchanger used in HVAC&R (Heating, Ventilation, Air Conditioning and Refrigeration) systems to improve the efficiency of refrigeration cycles. It is designed to facilitate heat transfer between two fluids, typically refrigerants, flowing through concentric tubes. The inner tube carries one fluid, while the outer tube carries another, allowing for efficient heat exchange between them.

## Key Features

The Dry All Economiser Heat Exchangers are distinguished by several key features that contribute to its efficiency, reliability, and versatility in various applications. Here are the main features:

- High Thermal Conductivity Materials
- Counterflow Configuration
- Compact and Space-Efficient Design
- Tube-in-Tube Structure
- Enhanced Surface Area
- Efficient Heat Recovery (Subcooling and Superheating)
- Easy Integration
- Low Maintenance
- Energy Efficiency

### Importance of Subcooling and Superheating in HVAC&R

In HVAC&R (Heating, Ventilation, Air Conditioning, and Refrigeration) systems, subcooling and superheating are critical processes that significantly impact the efficiency, performance, and reliability of the system.

### Subcooling

Subcooling refers to the process of lowering the temperature of the liquid refrigerant below its saturation temperature at a given pressure. This ensures that the refrigerant is fully in the liquid state before it enters the expansion valve.

1. **Improved Efficiency**
   Prevents Flash Gas
   Increased Cooling Capacity
2. **Enhanced System Performance**
   Optimal Operation of Expansion Valve
   Reduced Compressor Workload
3. **Prevention of Cavitation**
   Protects Components
4. **Energy Savings**
   Lower Energy Consumption

### Superheating

Superheating is the process of raising the temperature of the refrigerant vapor above its saturation temperature at a given pressure. This ensures that the refrigerant is fully vaporized before it enters the compressor.

1. **Protecting the Compressor**
   Prevents Liquid Ingestion
   Ensures Proper Lubrication
2. **Improved Compressor Efficiency**
   Stable Operation
   Reduced Risk of Refrigerant Slugging
3. **Increased Refrigerant Effect**
   Maximizes Cooling
4. **Enhanced System Control**
   Accurate Performance Monitoring

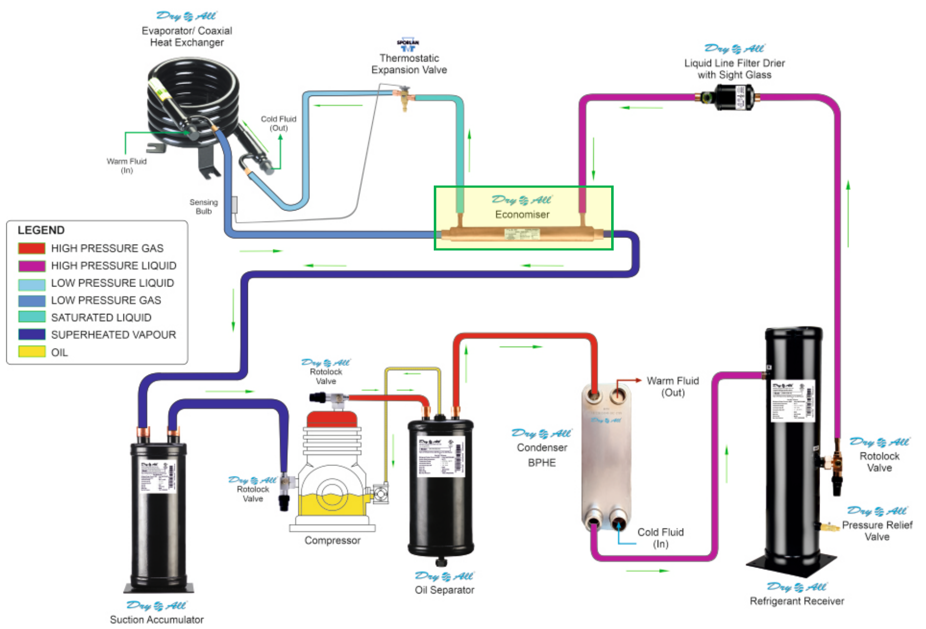
### Application

Dry All Economiser Heat Exchangers are versatile and highly efficient components used in a wide range of applications, particularly in systems that require effective thermal management.

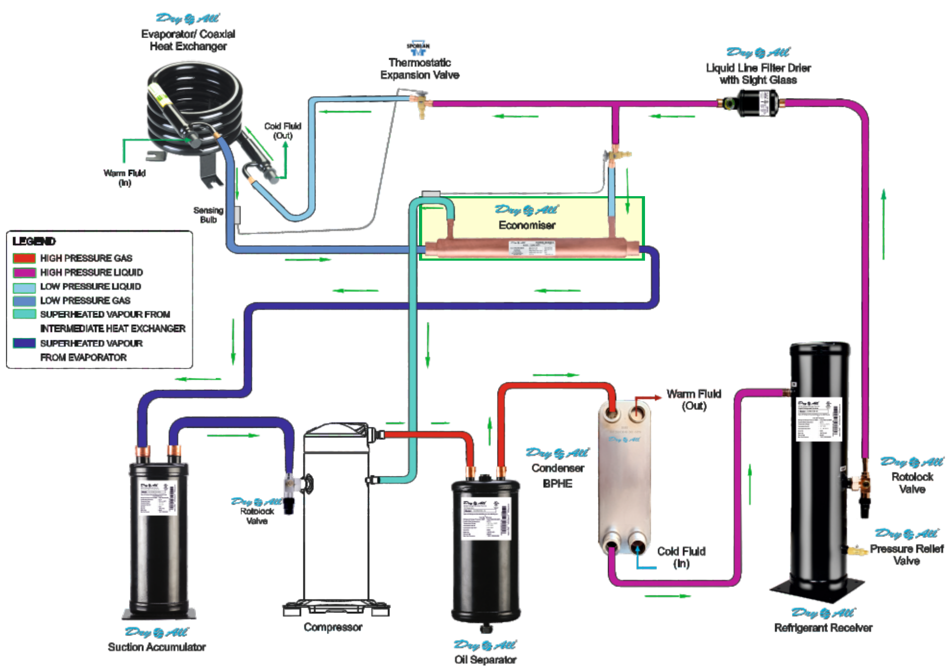
- HVAC Systems
- Refrigeration
- Heat Pumps
- Industrial Cooling
- Marine Application
- Power Generation
- Automotive Industry
- Data Centres
- Medical and Laboratory Equipment's

## Product installed in Refrigeration System

ECONOMIZED VAPOR COMPRESSION CYCLE




ECONOMIZED VAPOR INJECTION (EVI) CYCLE




**Note:** The above cycles are for reference purposes, to understand the positioning of the Economiser in the system.

## Working Principle

The Dry All Economiser Heat Exchangers operate based on the principles of heat conduction and convection to transfer thermal energy between two Refrigerants.


### Heat Exchange Mechanism

The DAEX consists of two concentric tubes, with one Refrigerant flowing through the inner tube and another flowing through the outer tube. The fluids can either be in a counterflow or parallel flow arrangement, though counterflow is more common due to its higher efficiency.

### Corrugated Tubes

The inner tube is often corrugated to increase the surface area for heat exchange and to induce turbulence in the fluid flow. This turbulence disrupts the boundary layer, enhancing convective heat transfer.

### Counterflow Configuration

In a counterflow arrangement, the fluids move in opposite directions. This configuration maintains a higher average temperature difference between the fluids over the length of the heat exchanger, maximizing the efficiency of heat transfer.

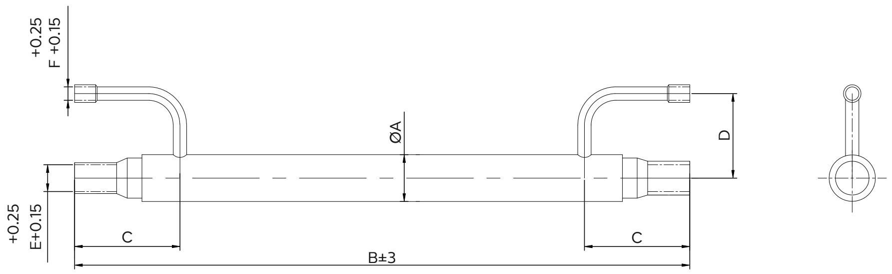
### Thermal Energy Exchange:

As the fluids travel through the heat exchanger, the primary fluid in the inner tube transfers its heat to the secondary fluid in the outer tube (or vice versa), depending on the temperature gradients. The temperature of the primary fluid decreases if it is being cooled, while the temperature of the secondary fluid increases if it is being heated, or vice versa.

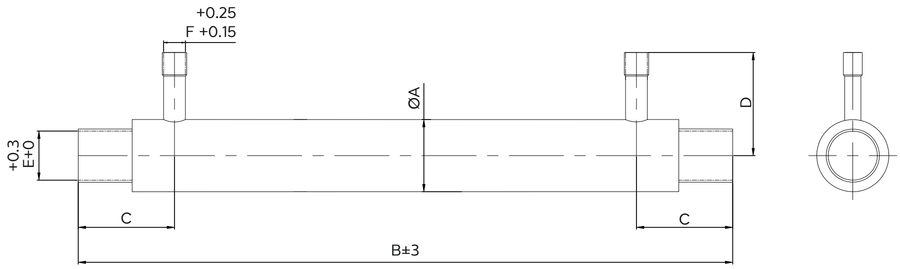
### Temperature Gradients

The continuous flow and the induced turbulence ensure that the temperature gradients are maintained, optimizing the efficiency of the heat exchange process.

## Drawing & Model table




**Drawing - 1**




**Drawing - 2**

| Sr. no | Model No | Capacity | | A mm | B mm | C mm | D mm | E mm | F mm | Drawing |
|---|---|---|---|---|---|---|---|---|---|---|
| | | HP | kW | | | | | | | |
| 1 | DAEX-50TT | 0.5 | 0.37 | 22.2 | 292 | 50 | 40 | 12.7 | 6.35 | 1 |
| 2 | DAEX-75TT | 0.75 | 0.56 | 28 | 298 | 50 | 40 | 15.88 | 9.52 | |
| 3 | DAEX-100TT | 1 | 0.75 | 28 | 350 | 50 | 40 | 15.88 | 9.52 | |
| 4 | DAEX-150TT | 1.5 | 1.12 | 35 | 368 | 45 | 53.5 | 22 | 9.52 | 2 |
| 5 | DAEX-200TT | 2 | 1.50 | 42 | 381 | 56 | 60 | 28.6 | 9.52 | |
| 6 | DAEX-300TT | 3 | 2.24 | 42 | 381 | 56 | 60 | 28.6 | 12.7 | |
| 7 | DAEX-500TT | 5 | 3.73 | 54 | 362 | 75 | 60 | 36 | 15.88 | |
| 8 | DAEX-700TT | 7 | 5.22 | 54 | 440 | 75 | 60 | 36 | 15.88 | |

### Material Specificaaons:

Outer Tube: Copper
Inner Tube: Copper
Refrigerant Connectons: Copper

## Nomenclature

Material of Tube (Copper)
Material of Shell (Copper)

**DAEX-700TT**

Capacity
Heat Exchanger
Dry All

## Technical Details

| Parameter | Tube Side | Shell Side |
|---|---|---|
| Max Working Pressure | 25 Bar | 30 Bar |
| Max Working Temperature | 60°C | 80°C |
| Allowable Refrigerants | Compatible with all types of CFC, HCFC, HFO, HFC and HC refrigerants | |

### Sizing and Selection Guidelines for Dry All Economiser Heat Exchangers in Refrigeration Systems

When selecting and sizing a heat exchanger for refrigeration systems, it is important to consider several key factors to ensure optimal performance, efficiency, and compatibility with the system.

**Connection Dimensions:**

The size of the heat exchanger can be determined from the connection dimensions that match the pipe dimensions of the refrigeration plant.

This ensures a seamless integration with existing piping and minimizes the need for additional modifications.

**Suction Gas Velocities:**

The design should aim for normal suction gas velocities to ensure efficient heat exchange and minimal pressure drop.

Maintaining appropriate gas velocities helps in reducing the risk of oil trapping and ensures proper refrigerant flow through the system.

**Pressure Drop Considerations:**

A small pressure drop is essential to maintain the efficiency of the refrigeration cycle.

Excessive pressure drops can lead to increased compressor work, reducing the overall efficiency of the system.

**Heat Exchanger Capacity:**

The capacity of the heat exchanger should match the capacity of the refrigeration plant.

Properly matched capacities ensure that the heat exchanger can handle the thermal load without becoming a bottleneck in the system.

**Oil Return to the Compressor:**

Ensuring oil return is critical for the reliable operation of the compressor.

The heat exchanger design should facilitate the return of oil to the compressor, preventing oil accumulation in the system and potential compressor damage.

**Avoiding Sweating and Frosting:**

If avoiding sweating and frosting-up of the suction line is a priority, the heat exchanger can be chosen one size larger than the size determined by the capacity.

A larger heat exchanger provides additional surface area for heat exchange, helping to maintain the suction line temperature above the dew point and preventing condensation and frosting.

**Auxiliary Condenser Selection:**

When the heat exchanger is used as an auxiliary condenser, it must always be selected according to the connection dimensions.

This ensures that the auxiliary condenser can adequately handle the refrigerant flow and effectively reject heat from the system.

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