

Trabajo autónomo 04 - solució

Si no se indica otra cosa, el formato de entrega de las tareas es en documento PDF.

Cada día de retraso en la entrega resta 0,5 puntos de la nota

Tarea 4:

Un compresor Bitzer, modelo 4FDC 5Y, trabaja en las siguientes condiciones:

Refrigerante R410A

$$v_C = 55^\circ C$$

$$v_E = 0^\circ C$$

SE = 10 K

SC = 10 K

- Utiliza el programa de simulación Bitzer software para obtener la potencia frigorífica \dot{Q}_E , el número y dimensiones de los cilindros y las dimensiones de las tomas de aspiración y descarga.

$$\dot{Q}_E = 11,09 \text{ kW}$$

Número cilindros 4

Diámetro 41 mm

Carrera 27 mm

Toma aspiración 22 mm - 7/8"

Toma descarga 16 mm - 5/8"

- Calcula el caudal de masa utilizando los datos del diagrama p h

$$\dot{m} = \frac{\dot{Q}_E}{Q_E} = \frac{\dot{Q}_E}{(h_1 - h_4)} = \frac{11,09 \text{ kW}}{(435 \frac{\text{kJ}}{\text{kg}} - 280 \frac{\text{kJ}}{\text{kg}})} = 0,071 \frac{\text{kg}}{\text{s}}$$

- Dibuja el ciclo en el diagrama p h

4. Calcula la eficiencia del ciclo

$$EER = \frac{\dot{Q}_E}{P_{comp}} = 11,09 \frac{kW}{4,79} kW = 2,32$$

5. Calcula el volumen desplazado (frecuencia de 50 Hz) y el rendimiento volumétrico

$$\dot{V}_{desp} = V_{motor} \cdot \frac{RPM}{60 \frac{s}{min}}$$

$$V_{motor} = Z \cdot A \cdot s = 4 \cdot \pi \cdot (0,0205 m)^2 \cdot 0,027 m = 0,000143 m^3$$

Z número de cilindros

A sección cilindro en m²

s carrera cilindro en m

$$\dot{V}_{desp} = V_{motor} \cdot \frac{RPM}{60 \frac{s}{min}} = 0,000143 m^3 \cdot \frac{1450 RPM}{60 \frac{s}{min}} = 0,003444 \frac{m^3}{s} = 12,4 \frac{m^3}{h}$$

$$\dot{V}_1 = \dot{m} \cdot v_{esp1} = 0,071 \frac{kg}{s} \cdot 0,035 \frac{m^3}{kg} = 0,0025 \frac{m^3}{s}$$

$$\eta_{vol} = \frac{\dot{V}_1}{\dot{V}_{despl}} = \frac{0,0025 \frac{m^3}{s}}{0,003444 \frac{m^3}{s}} = 0,721$$

6. Calcula la velocidad del refrigerante en aspiración y descarga (grueso de pared del tubo 1 mm)

7. Adjunta capturas de pantalla de los programas de simulación Bitzer software

Envia el trabajo por correo electrónico a pposada@cifpnauticopesquera.es

El plazo de entrega es martes 27/01/26.

BITZER SOFTWARE

Reciprocating Compressors, Semi-Hermetic

Mode: Refrigeration and air conditio...

Refrigerant: R410A

Reference temperature: Dew point temp.

Compressor type: Single Compressor

Series: Standard

Motor version: all

Compressor selection

Cooling capacity: 10 kW

Compressor model: 4FDC-5Y Ind. former types

Operating point

Evaporating SST: 0 °C

Condensing SDT: 55 °C

Operating conditions

Liq. subc. (In condenser): 10 K

Suct. gas superheat: 10 K

Useful superheat: 100 %

Operating mode: Auto

Capacity control

without

VARISTEP

Stepped

Power supply

Supply frequency: 50Hz

Supply voltage: 400V-Y (40S)

Result **Limits** **Technical Data** **Dimensions** **Accessories** **Information**

Next

Compressor	4FDC-5Y-40S
Capacity steps	100%
Cooling capacity	11,09 kW
Cooling capacity *	9,77 kW
Evaporator capacity	11,09 kW
Power input	4,79 kW
Current (400V)	8,85 A
Voltage range	380-420V
Condenser capacity	15,88 kW
COP/EER	2,31
COP/EER *	2,04
Mass flow	255 kg/h
Operating mode	Standard
Discharge gas temp. w/o cooling	106,6 °C

 BITZER SOFTWARE

Result Limits **Technical Data** Dimensions Accessories

Reciprocating Compressors, Semi-Hermetic

Mode: Refrigeration and air conditio... |

Refrigerant: R410A |

Reference temperature: Dew point temp. |

Compressor type: Single Compressor |

Series: Standard |

Motor version: all |

Compressor selection

Cooling capacity 10 kW

Compressor model 4FDC-5Y |

Incl. former types

Operating point

Evaporating SST: 0 °C

Condensing SDT: 50 °C

Operating conditions

Liq. subc. (in condenser): 10 K

Suct. gas superheat: 10 K

Useful superheat: 100 % |

Operating mode: Auto |

Capacity control

without

VARISTEP |

Stepped 100% |

Power supply

Supply frequency: 50Hz |

Supply voltage: 400V-Y (40S) |

Technical Data

Displacement (1450rpm 50Hz): 12,4 m³/h

Displacement (1750rpm 60Hz): 15,0 m³/h

No. of cylinder x bore x stroke: 4 x 41 mm x 27 mm

Weight: 105 kg

Max. pressure (LP/HP): 25 / 42 bar

Connection suction line: 22 mm - 7/8"

Connection discharge line: 16 mm - 5/8"

Oil type R410A: BSE55 (Standard)

Motor Data

Motor voltage (more on request): 380-420V Y-3-50Hz

Max. operating current: 10,6 A

Starting current (Rotor locked): 62,2 A

Max. power input: 6,4 kW

Extent Of Delivery (Standard)

Motor protection: SE-B3(Standard), SE-B2(Option)

Enclosure class: IP65

Vibration dampers: Standard

Oil charge: 2,00 dm³

Available Options

Discharge gas temperature sensor: Option

Start unloading: Option

SOLKANE [Diagrama p,h Solkane® 410A]



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Solkane® 410A

- Isotermas [°C]
- Isocóricas [m³/kg]
- Isentrópicas [kJ/kgK]

SOLVAY