

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

$$v_C = 55^\circ\text{C}$$

$$v_E = 0^\circ\text{C}$$

$$SE = 10\text{ K}$$

$$SC = 10\text{ K}$$

1. 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"

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

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

3. 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 (grosor 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

Result Limits Technical Data Dimensions Accessories Information

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: 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: Auto

☐ Stepped: 100%

Power supply

Supply frequency: 50Hz

Supply voltage: 400V-Y (40S)

Diagram

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

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-3Y

☐ Incl. 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

Auto

100%

Stepped

Power supply

Supply frequency

50Hz

Supply voltage

400V-Y (40S)

Result

Limits

Technical Data

Dimensions

Accessories

4FDC-3Y

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(Optional)
Enclosure class	IP65
Vibration dampers	Standard
Oil charge	2,00 dm³

Available Options

Discharge gas temperature sensor	Option
Start unloading	Option

