Table 5

Reference thermodynamic values of a prior art thermal operating machine

Refrigerant	***GWP_{100}***	***Cooling Capacity***	***Condensation Temperature***	***Evaporation Temperature***	**η_C (Compression Efficiency)**	***Mass Flow*** **$\dot{m}$**
R404a	3922	100 kW	-40 °C	40 °C	0,75	1,14 kg/s

Table 6

Energy values of a prior art thermal operating machine

Calculated Value	***Equation***	***Result***
Mechanical power of the compressor	$\dot{L}c_{AN} = \dot{m} \cdot (h_{2;AN} - h_{1;AN})$	81,38 kW
Refrigeration Power	$\dot{Q}ev_{AN} = \dot{m} \cdot (h_{1;AN} - h_{4;AN})$	100,00 kW
Coefficient of Performance	$COP_{AN} = \frac{\dot{Q}ev_{AN}}{\dot{L}c_{AN}}$	1,23

Table 7

Reference thermodynamic values of the basic operation a thermal operating machine according to the present invention

Refrigerant	***GWP_{100}***	***Cooling Capacity***	***Condensation Temperature***	***Evaporation Temperature***	**$\eta_{C\,(1)}$ (Compression Efficiency)**	**$\eta_{C\,(6)}$ (Compression Efficiency)**	**η_t (Expansion Efficiency)**
R404a	3922	100 kW	-40 °C	40 °C	0,75	0,8	0,85

Table 8

Energy values of the basic operation a thermal operating machine according to the present invention

Calculated Value	***Equation***	***Result***
Mechanical power of the compressor (1)	$\dot{L}_{c1} = \dot{m}_2 \cdot (h_2 - h_1)$	5,02 kW
Mechanical power of the compressor (6)	$\dot{L}_{c2} = \dot{m} \cdot (h_4 - h_3)$	67,82 kW
Total mechanical compression power	$\dot{L}_{cTot} = \dot{L}_{c1} + \dot{L}_{c2}$	72,83 kW
Mechanical expander power	$\dot{L}_{t1} = \dot{m}_1 \cdot (h_9 - h_{10})$	6,94 kW
Total mechanical power	$\dot{L}_{Tot} = \dot{L}_{cTot} - \dot{L}_{tTot}$	65,89 kW
Refrigeration Power	$\dot{Q}_{ev} = \dot{m}_2 \cdot (h_1 - h_8)$	100,00 kW
Coefficiente of Performance (COP)	$COP = \frac{\dot{Q}_{ev}}{\dot{L}_{Tot}}$	**1,52**
COP Variation	$\Delta COP = \left[\frac{COP - COP_{AN}}{COP_{AN}}\right] \cdot 100$	**23,52 %**

$\dot{m}_1 = 0{,}31 \text{ kg / s}$

$\dot{m}_2 = 0{,}74 \text{ kg / s}$

$\dot{m} = 1{,}05 \text{ kg / s}$