

| L.p. | Opis | Typ | Oznaczenie | Producent | Ilość | J.m. |
|------|-----------|-----|--|-----------|-------|------|
| 1 | Wymiennik | | 36E-2 36E-3 36E-4 36E-5 36E-6 36E-7 36E-8 36E-9 36E-10 36E-14 36E-12 | HEXONIC | 11 | szt |

UWAGA: Wymiennik 36E-14 taki sam jak 36E-12.

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e-mail: Marek.Potalski@orlen.pl

WYKAZ WYMIENNIKÓW CIEPŁA

| Oznaczenie wg schematu | Funkcja aparatu | Ciepło wymieniane | Charakterystyka D[mm], Lr[mm], n rurek/O.D., F [m ²] | Medium | | Parametry pracy | | Parametry obliczeniowe | | Materiał | Uwagi |
|---------------------------|-------------------------------------|-------------------|--|---------|------------------|-----------------|------------|------------------------|---------|----------|-----------------|
| | | | | | | Temp. | Ciśn. | Temp. | Ciśn. | | |
| [-] | [-] | [kW] | [mm, m ²] | [-] | [-] | [°C] | [kPag] | [°C] | [kPag] | [-] | |
| 36E-2 | Skrapłacz kolumny 36C-1 | Ok. 14.7 | D= 100 Lr= ok.600 F= 0,8 | plaszcz | Metanol, DMC | 110/190 | 30 | 200 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-3 | Chłodnica destylatu z kolumny 36C-1 | Ok. 0.7 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol, DMC | 64 | 30 | 100 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-4 | Skrapłacz kolumny 36C-2 | Ok. 0.23 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol | 190 | 30 | 200 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-5 | Chłodnica destylatu z kolumny 36C-2 | Ok. 0.03 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol | 64 | 30 | 100 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-6 | Chłodnica glikolu | Ok. 1.8 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Glikol etylenowy | 196 | 30 | 200 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-7 | Skrapłacz kolumny 36C-3 | Ok. 3.8 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol, DMC | 90 | 30 | 200 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-8 | Chłodnica destylatu kolumny 36C-3 | Ok. 0.4 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol, DMC | 64 | 30 | 100 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-9 | Chłodnica DMC | Ok. 0.4 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Węglan dimetylu | 90 | 30 | 200 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-10 | Chłodnica MR | Ok. 2.1 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | MR z 36C1 | 190 | 5 | 200 | 50 | 316L | Aparat zakupowy |
| | | | | rurki | Woda chłodząca | 25 | 250 | 40 | 600 | 316L | |
| 36E-14 | Skrapłacz permeatu (2 stopień) | Ok. 0.63 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol, DMC | 90 | 0,0/ -99,2 | 200 | 50/-100 | 316L | Aparat zakupowy |
| | | | | rurki | Woda lodowa | 7 | 250 | 40 | 600 | 316L | |
| 36E-12 | Skrapłacz permeatu (1 stopień) | Ok. 0.63 | D= 80 Lr= ok.400 F= 0,3 | plaszcz | Metanol, DMC | 90 | 0,0/ -99,2 | 200 | 50/-100 | 316L | Aparat zakupowy |
| | | | | rurki | Woda lodowa | 7 | 250 | 40 | 600 | 316L | |

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|---|--|--|------------|-------------------|----------------------------------|-------------------|--|---------------|--|------------------|--|
| | WYMIENNIK CIEPŁA PŁASZCZOWO-RUROWY SPECYFIKACJA TECHNICZNA / DATASHEET | | | | | | | | | | |
| OGÓLNE | | | | | | | | | | | |
| Numer technologiczny | | 36E-2 | | | | | | | | | |
| Ilość | | 1 | | | | | | | | | |
| Przeznaczenie | | Skrapłacz kolumny 36C-1 | | | | | | | | | |
| Producent | | HEXONIC | | | | | | | | | |
| Rysunek | | wg katalogu | | | | | | | | | |
| Wymiar | | 800 mm | | | | | | | | | |
| Typ | | <input checked="" type="checkbox"/> Poziomy | | | <input type="checkbox"/> Pionowy | | | Model: H1K | | | |
| Podłączone do / z | | Z kolumny destylacyjnej 36C-1 do zbiornika 36V-4 | | | | | | | | | |
| Powierzchnia / Jednostka | | [m²] | | 0,3 | | | | | | | |
| Płaszcz / Jednostka | | | | | | | | | | | |
| Powierzchnia / Płaszcz | | [m²] | | | | | | | | | |
| DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU | | | | | | | | | | | |
| | | Jednostki miary | | STRONA ZIMNA | | | | STRONA GORĄCA | | | |
| | | | | Wlot | | Wylot | | Wlot | | Wylot | |
| Nazwa medium | | | | Woda chłodząca | | | | Metanol, DMC | | | |
| Całkowita ilość medium | | norm. | [kg/h] | | | | | | | | |
| | | max. | [kg/h] | | | | | | | | |
| Opary | | norm. | [kg/h] | | | | | 46,5 | | | |
| | | max. | [kg/h] | | | | | | | | |
| Ciecz | | norm. | [kg/h] | 250 | | 250 | | | | 46,5 | |
| | | max. | [kg/h] | | | | | | | | |
| Para | | norm. | [kg/h] | | | | | | | | |
| | | max. | [kg/h] | | | | | | | | |
| Związki niekondensujące | | norm. | [kg/h] | | | | | | | | |
| | | max. | [kg/h] | | | | | | | | |
| Odparowana ciecz | | norm. | [kg/h] | | | | | | | | |
| | | max. | [kg/h] | | | | | | | | |
| Skroplona para | | norm. | [kg/h] | | | | | | | | |
| | | max. | [kg/h] | | | | | | | | |
| Temperatura robocza | | norm. | [°C] | 25 | | 30 | | 110/190 | | 64 | |
| | | max. | [°C] | | | | | | | | |
| Ciśnienie robocze | | norm. | [bar] | 2,5 | | 2,5 | | 0,3 | | 0,3 | |
| | | max. | [bar] | | | | | | | | |
| Gęstość | | | [kg/m³] | 997 dla 25 [°C] | | 992 dla 40 [°C] | | dla [°C] | | 750 dla 64 [°C] | |
| Lepkość | | | [cP] | 0,89 dla 25 [°C] | | 0,65 dla 40 [°C] | | dla [°C] | | 0,35 dla 64 [°C] | |
| Ciepło właściwe | | | [kJ/kg·°C] | 4178 dla 25 [°C] | | 4175 dla 40 [°C] | | dla [°C] | | 2,76 dla 64 [°C] | |
| Przewodność cieplna | | | [W/m·°C] | 0,606 dla 25 [°C] | | 0,633 dla 40 [°C] | | dla [°C] | | 0,2 dla 64 [°C] | |
| Ciepło przemiany faz | | | [kJ/kg] | 2257 | | 2257 | | | | | |
| Masa cząsteczkowa | | | [g/mol] | 18,016 | | 18,016 | | | | | |
| Drogi / płaszcz | | | ilość | 1 | | | | 1 | | | |
| Współczynnik oporu cieplnego | | | [m²·°C/W] | | | | | | | | |
| Prędkość przepływu | | norm. | [m/s] | | | | | | | | |
| | | max. | [m/s] | | | | | | | | |
| Spadek ciśnienia | | norm. | [bar] | | | | | | | | |
| | | max. | [bar] | | | | | | | | |
| Współczynnik przenikania ciepła | | norm. | [W/m²·°C] | | | | | bez osadu | | | |
| | | max. | [W/m²·°C] | | | | | bez osadu | | | |
| Wymienione ciepło | | norm. | [kW] | | | | | | | | |
| | | max. | [kW] | | | | | | | | |
| Średnia różnica temperatur | | | [°C] | | | | | | | | |
| Ekstremalne warunki przyjęte dla doboru wymiennika: | | | | | | | | | | | |
| Temperatura ścianki płaszczu | | °C | | | | | | | | | |
| Temperatura ścianki rurek | | °C | | | | | | | | | |
| UWAGI: | *) Wypełnia dostawca | | | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | | | |
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| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | | Rewizja: | 0 | | | | | | | | |
| | | Data: | mar.23 | | | | | | | | |
| | | Podpis: | | | | | | | | | |
| | | UWAGI: | | | | | | | | | |
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WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PLASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|---|--------------|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | | <input type="checkbox"/> Tylko kupującego | |
| | Jed.miary | STRONA PLASZCZA | | STRONA RUREK |
| Projektowe nadciśnienie | [bar] | 16 | | 16 |
| Projektowa temperatura | [°C] | 200 | | 200 |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|-----------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Plaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dna sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie płaszcz: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 101,6 |
| Plaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwałcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 10,3 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
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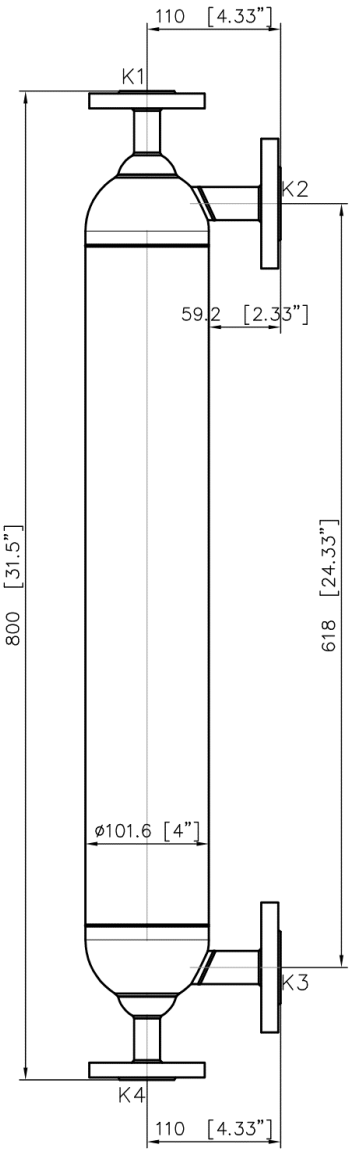
WYPEŁNIENIE

| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

| | | | | | | | | | |
|--|----------|--------|--|--|--|--|--|--|--|
| UWAGI OGOLNE | | | | | | | | | |
| *) Wypełnia dostawca | | | | | | | | | |
| | | | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | Rewizja: | 0 | | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| UWAGI: | | | | | | | | | |
| | | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|--|--|--|--|--|--|--|--|
| Rewizja: | 0 | | | | | | | | |
| Data: | mar.23 | | | | | | | | |
| Podpis: | | | | | | | | | |

UWAGI:

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

OGÓLNE

| | | | | | |
|----------------------------|---|----------------------------------|------------|--|--|
| Numer technologiczny | 36E-3 | | | | |
| Ilość | 1 | | | | |
| Przeznaczenie | Chłodnica destylatu z 36C-1 | | | | |
| Producent | HEXONIC | | | | |
| Rysunek | wg katalogu | | | | |
| Wymiar | 585 mm | | | | |
| Typ | <input checked="" type="checkbox"/> Poziomy | <input type="checkbox"/> Pionowy | Model: H0K | | |
| Podłączone do / z | Ze zbiornika V-4 do zbiornika V-10 | | | | |
| Powierzchnia / Jednostka | [m²] | 0,3 | | | |
| Plaszcze / Jednostka | | | | | |
| Powierzchnia / Plaszczyzna | [m²] | | | | |

DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU

| | | Jednostki miary | STRONA ZIMNA | | | | STRONA GORĄCA | | | |
|---------------------------------|-------|-----------------|----------------|-------------|--------|-------------|---------------|-------------|-------|----------|
| | | | Wlot | | Wylot | | Wlot | | Wylot | |
| Nazwa medium | | | Woda chłodząca | | | | Metanol, DMC | | | |
| Całkowita ilość medium | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Opary | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Ciecz | norm. | [kg/h] | 250 | | 250 | | 46,5 | | 46,5 | |
| | max. | [kg/h] | | | | | | | | |
| Para | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Związki niekondensujące | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Odparowana ciecz | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Skroplona para | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Temperatura robocza | norm. | [°C] | 25 | | 30 | | 64 | | 30 | |
| | max. | [°C] | | | | | | | | |
| Ciśnienie robocze | norm. | [bar] | 2,5 | | 2,5 | | 0,3 | | 0,3 | |
| | max. | [bar] | | | | | | | | |
| Gęstość | | [kg/m³] | 997 | dla 25 [°C] | 992 | dla 40 [°C] | 750 | dla 64 [°C] | | dla [°C] |
| Lepkość | | [cP] | 0,89 | dla 25 [°C] | 0,65 | dla 40 [°C] | 0,35 | dla 64 [°C] | | dla [°C] |
| Ciepło właściwe | | [kJ/kg·°C] | 4178 | dla 25 [°C] | 4175 | dla 40 [°C] | 2,76 | dla 64 [°C] | | dla [°C] |
| Przewodność cieplna | | [W/m·°C] | 0,606 | dla 25 [°C] | 0,633 | dla 40 [°C] | 0,2 | dla 64 [°C] | | dla [°C] |
| Ciepło przemiany faz | | [kJ/kg] | 2257 | | 2257 | | | | | |
| Masa cząsteczkowa | | [g/mol] | 18,016 | | 18,016 | | | | | |
| Drogi / płaszczyz | | ilość | 1 | | | | 1 | | | |
| Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | |
| Prędkość przepływu | norm. | [m/s] | | | | | | | | |
| | max. | [m/s] | | | | | | | | |
| Spadek ciśnienia | norm. | [bar] | | | | | | | | |
| | max. | [bar] | | | | | | | | |
| Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | bez osadu | | | |
| | max. | [W/m²·°C] | | | | | bez osadu | | | |
| Wymienione ciepło | norm. | [kW] | | | | | | | | |
| | max. | [kW] | | | | | | | | |
| Srednia różnica temperatur | | [°C] | | | | | | | | |

Ekstremalne warunki przyjęte dla doboru wymiennika:

| | |
|------------------------------|----|
| Temperatura ścianki płaszcza | °C |
| Temperatura ścianki rurek | °C |

| | | | | | | | | | | |
|-----------------------------|---|--------------------------------|--------|---|--|--|--|--|--|--|
| UWAGI: | *) Wypełnia dostawca | | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | | |
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| | | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | | |
| | | Rewizja: | 0 | 1 | | | | | | |
| | | Data: | mar.23 | | | | | | | |
| | | Podpis: | | | | | | | | |
| | | UWAGI: | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PŁASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|---|--------------|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | | <input type="checkbox"/> Tylko kupującego | |
| | Jed.miary | STRONA PŁASZCZA | | STRONA RUREK |
| Projektowe nadciśnienie | [bar] | 16 | | 16 |
| Projektowa temperatura | [°C] | 200 | | 200 |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|------------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Płaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dno sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie płaszcza: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| Rurki | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| Płaszcz | O D [mm] | 80 |
| | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwałcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

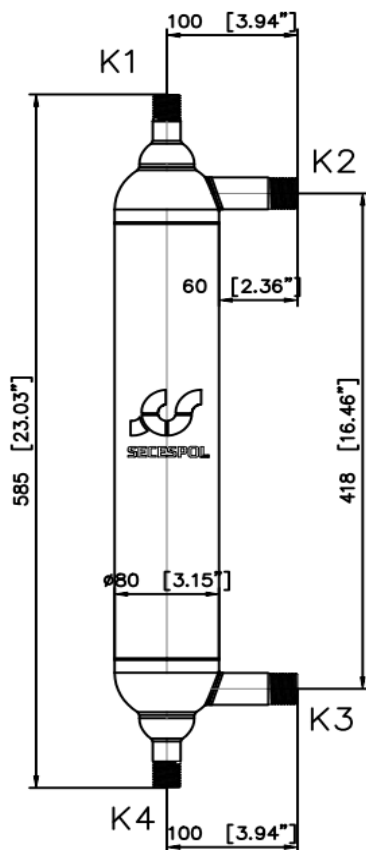
WYPEŁNIENIE

| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

| | | | | | | | | | |
|--|----------|--------|---|--|--|--|--|--|--|
| UWAGI OGOLNE | | | | | | | | | |
| *) Wypełnia dostawca | | | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | Rewizja: | 0 | 1 | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| UWAGI: | | | | | | | | | |
| | | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|---|--|--|--|--|--|--|--|
| Rewizja: | 0 | 1 | | | | | | | |
| Data: | mar.23 | | | | | | | | |
| Podpis: | | | | | | | | | |
| UWAGI: | | | | | | | | | |

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PLASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|---|--------------|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | | <input type="checkbox"/> Tylko kupującego | |
| | Jed.miary | STRONA PLASZCZA | | STRONA RUREK |
| Projektowe nadciśnienie | [bar] | 16 | | 16 |
| Projektowa temperatura | [°C] | 200 | | 200 |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|-----------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Plaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dna sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie płaszcz: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 80 |
| Plaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwałcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

WYPEŁNIENIE

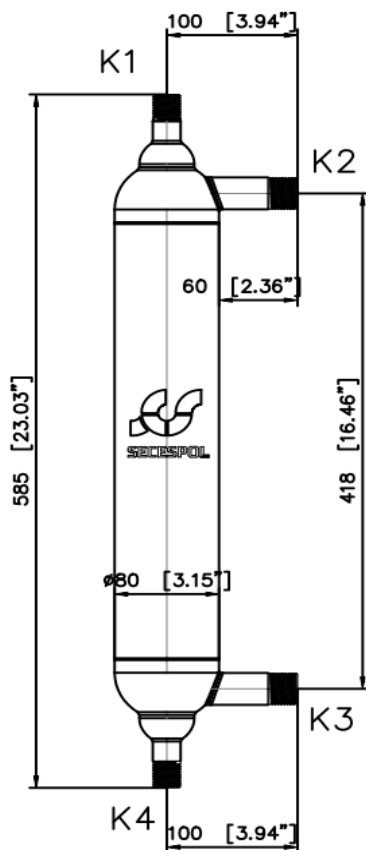
| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

UWAGI OGOLNE

| | | | | | | | | | |
|--|----------|--------|---|--|--|--|--|--|--|
| *) Wypełnia dostawca | | | | | | | | | |
| | | | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | Rewizja: | 0 | 1 | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| UWAGI: | | | | | | | | | |
| | | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|---|--|--|--|--|--|--|--|
| Rewizja: | 0 | 1 | | | | | | | |
| Data: | mar.23 | | | | | | | | |
| Podpis: | | | | | | | | | |

UWAGI:

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

OGÓLNE

| | | | | | |
|----|--------------------------|--|----------------------------------|------------|--|
| 1 | OGOLNIE | | | | |
| 2 | Numer technologiczny | 36E-4 | | | |
| 3 | Ilość | 1 | | | |
| 4 | Przeznaczenie | Chłodnica kolumny destylacyjnej C-2 | | | |
| 5 | Producent | HEXONIC | | | |
| 6 | Rysunek | wg katalogu | | | |
| 7 | Wymiar | 585 mm | | | |
| 8 | Typ | <input checked="" type="checkbox"/> Poziomy | <input type="checkbox"/> Pionowy | Model: H0K | |
| 9 | Podłączone do / z | Z kolumny destylacyjnej 36C-2 do zbiornika 36V-5 | | | |
| 10 | Powierzchnia / Jednostka | [m²] | 0,3 | | |
| 11 | Plaszcze / Jednostka | | | | |
| 12 | Powierzchnia / Plaszc | [m²] | | | |

DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU

| | | | Jednostki miary | STRONA ZIMNA | | | | | | STRONA GORĄCA | | | | | | | | |
|------------------------------------|-------|------------|--------------------|----------------|----|--------|-------|-----|-----------|---------------|-------|-----|-------|------|------|-----|----|------|
| | | | | Wlot | | | Wylot | | | Wlot | | | Wylot | | | | | |
| Nazwa medium | | | | woda chłodząca | | | | | | Metanol | | | | | | | | |
| Całkowita ilość medium | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Opary | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Ciecz | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Para | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Związki niekondensujące | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Odparowana ciecz | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Skroplona para | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Temperatura robocza | norm. | [°C] | 25 | | | 30 | | | 190 | | | 64 | | | | | | |
| | max. | [°C] | | | | | | | | | | | | | | | | |
| Ciśnienie robocze | norm. | [bar] | 2,5 | | | 2,5 | | | 0,3 | | | 0,3 | | | | | | |
| | max. | [bar] | | | | | | | | | | | | | | | | |
| Gęstość | | [kg/m³] | 997 | dla | 25 | [°C] | 992 | dla | 40 | [°C] | 653 | dla | 150 | [°C] | 750 | dla | 64 | [°C] |
| Lepkość | | [cP] | 0,89 | dla | 25 | [°C] | 0,65 | dla | 40 | [°C] | 0,14 | dla | 150 | [°C] | 0,35 | dla | 64 | [°C] |
| Ciepło właściwe | | [kJ/kg·°C] | 4178 | dla | 25 | [°C] | 4175 | dla | 40 | [°C] | 8,0 | dla | 150 | [°C] | 2,76 | dla | 64 | [°C] |
| Przewodność cieplna | | [W/m·°C] | 0,606 | dla | 25 | [°C] | 0,633 | dla | 40 | [°C] | 0,193 | dla | 150 | [°C] | 0,2 | dla | 64 | [°C] |
| Ciepło przemiany faz | | [kJ/kg] | 2257 | | | 2257 | | | | | | | | | | | | |
| Masa cząsteczkowa | | [g/mol] | 18,016 | | | 18,016 | | | | | | | | | | | | |
| Drogi / płaszczyz | | ilość | 1 | | | | | | 1 | | | | | | | | | |
| Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | | | | | | | | | |
| Prędkość przepływu | norm. | [m/s] | | | | | | | | | | | | | | | | |
| | max. | [m/s] | | | | | | | | | | | | | | | | |
| Spadek ciśnienia | norm. | [bar] | | | | | | | | | | | | | | | | |
| | max. | [bar] | | | | | | | | | | | | | | | | |
| Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | | | bez osadu | | | | | | | | | |
| | max. | [W/m²·°C] | | | | | | | bez osadu | | | | | | | | | |
| Wymienione ciepło | norm. | [kW] | | | | | | | | | | | | | | | | |
| | max. | [kW] | | | | | | | | | | | | | | | | |
| Średnia różnica temperatur | | [°C] | | | | | | | | | | | | | | | | |

Ekstremalne warunki przyjęte dla doboru wymiennika:

| | |
|------------------------------|----|
| Temperatura ścianki płaszcza | °C |
| Temperatura ścianki rurek | °C |

| | | | | | | | | | |
|-----------------------------|---|--------------------------------|--------|---------|--|--|--|--|--|
| UWAGI: | *) Wypełnia dostawca | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | |
| | | Rewizja: | 0 | 1 | | | | | |
| | | Data: | mar.23 | 10.2022 | | | | | |
| | | Podpis: | | | | | | | |
| | | UWAGI: | | | | | | | |
| | | | | | | | | | |

WYMIENNIK CIEPŁA

PŁASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PŁASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|--|--|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | <input type="checkbox"/> Tylko kupującego | | |
| | Jed.miary | STRONA PŁASZCZA | STRONA RUREK | |
| Projektowe nadciśnienie | [bar] | 16 | 16 | |
| Projektowa temperatura | [°C] | 200 | 200 | |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|------------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Płaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dna sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie płaszcza: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 80 |
| Płaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwałcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

WYPEŁNIENIE

| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

UWAGI OGOLNE

*) Wypełnia dostawca

X - Odległość (wysokość) od bazy

Y - Odległość (długość) od osi głównej

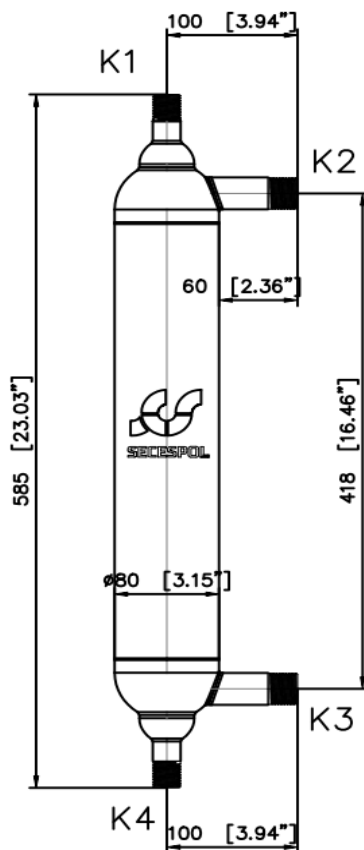
Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca

| | | | | | | | | | |
|--|----------|--------|---------|--|--|--|--|--|--|
| | Rewizja: | 0 | 1 | | | | | | |
| | Data: | mar.23 | 10.2022 | | | | | | |
| | Podpis: | | | | | | | | |

UWAGI:

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|---------|--|--|--|--|--|--|--|
| Rewizja: | 0 | 1 | | | | | | | |
| Data: | mar.23 | 10.2022 | | | | | | | |
| Podpis: | | | | | | | | | |

UWAGI:

| | | | | | | | | | | | | |
|----|---|---|----------------|----------------------------------|----|------------|-------------------|---------------|------------------|-------|-------------------|--|
| | WYMIENNIK CIEPŁA PŁASZCZOWO-RUROWY | | | | | | | | | | | |
| | SPECYFIKACJA TECHNICZNA / DATASHEET | | | | | | | | | | | |
| 1 | OGÓLNE | | | | | | | | | | | |
| 2 | Numer technologiczny | 36E-5 | | | | | | | | | | |
| 3 | Ilość | 1 | | | | | | | | | | |
| 4 | Przeznaczenie | Chłodnica destylatu z 36C-2 | | | | | | | | | | |
| 5 | Producent | HEXONIC | | | | | | | | | | |
| 6 | Rysunek | wg katalogu | | | | | | | | | | |
| 7 | Wymiar | 585 mm | | | | | | | | | | |
| 8 | Typ | <input checked="" type="checkbox"/> Poziomy | | <input type="checkbox"/> Pionowy | | Model: H0K | | | | | | |
| 9 | Podłączone do / z | Ze zbiornika V-5 do zbiornika V-2 | | | | | | | | | | |
| 10 | Powierzchnia / Jednostka | [m²] | | 0,3 | | | | | | | | |
| 11 | Płaszcz / Jednostka | | | | | | | | | | | |
| 12 | Powierzchnia / Płaszcz | [m²] | | | | | | | | | | |
| 13 | DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU | | | | | | | | | | | |
| 14 | | Jednostki miary | STRONA ZIMNA | | | | | STRONA GORĄCA | | | | |
| 15 | | | Wlot | | | Wylot | | Wlot | | Wylot | | |
| 16 | Nazwa medium | | woda chłodząca | | | | | Metanol | | | | |
| 17 | Całkowita ilość medium | norm. | [kg/h] | | | | | | | | | |
| 18 | | max. | [kg/h] | | | | | | | | | |
| 19 | Opary | norm. | [kg/h] | | | | | | | | | |
| 20 | | max. | [kg/h] | | | | | | | | | |
| 21 | Ciecz | norm. | [kg/h] | | | | | | | | | |
| 22 | | max. | [kg/h] | | | | | | | | | |
| 23 | Para | norm. | [kg/h] | | | | | | | | | |
| 24 | | max. | [kg/h] | | | | | | | | | |
| 25 | Związki niekondensujące | norm. | [kg/h] | | | | | | | | | |
| 26 | | max. | [kg/h] | | | | | | | | | |
| 27 | Odparowana ciecz | norm. | [kg/h] | | | | | | | | | |
| 28 | | max. | [kg/h] | | | | | | | | | |
| 29 | Skroplona para | norm. | [kg/h] | | | | | | | | | |
| 30 | | max. | [kg/h] | | | | | | | | | |
| 31 | Temperatura robocza | norm. | [°C] | 25 | | | 30 | | 64 | | 20 | |
| 32 | | max. | [°C] | | | | | | | | | |
| 33 | Ciśnienie robocze | norm. | [bar] | 2,5 | | | 2,5 | | 0,3 | | 0,3 | |
| 34 | | max. | [bar] | | | | | | | | | |
| 35 | Gęstość | | [kg/m³] | 997 dla 25 [°C] | | | 992 dla 40 [°C] | | 750 dla 64 [°C] | | 794 dla 20 [°C] | |
| 36 | Lepkość | | [cP] | 0,89 dla 25 [°C] | | | 0,65 dla 40 [°C] | | 0,35 dla 64 [°C] | | 0,54 dla 20 [°C] | |
| 37 | Ciepło właściwe | | [kJ/kg·°C] | 4178 dla 25 [°C] | | | 4175 dla 40 [°C] | | 2,76 dla 64 [°C] | | 2,5 dla 20 [°C] | |
| 38 | Przewodność cieplna | | [W/m·°C] | 0,606 dla 25 [°C] | | | 0,633 dla 40 [°C] | | 0,2 dla 64 [°C] | | 0,203 dla 20 [°C] | |
| 39 | Ciepło przemiany faz | | [kJ/kg] | 2257 | | | 2257 | | | | | |
| 40 | Masa cząsteczkowa | | [g/mol] | 18,016 | | | 18,016 | | | | | |
| 41 | Drogi / płaszcz | | ilość | 1 | | | | | 1 | | | |
| 42 | Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | | |
| 43 | Prędkość przepływu | norm. | [m/s] | | | | | | | | | |
| 44 | | max. | [m/s] | | | | | | | | | |
| 45 | Spadek ciśnienia | norm. | [bar] | | | | | | | | | |
| 46 | | max. | [bar] | | | | | | | | | |
| 47 | Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | | bez osadu | | | |
| 48 | | max. | [W/m²·°C] | | | | | | bez osadu | | | |
| 49 | Wymienione ciepło | norm. | [kW] | | | | | | | | | |
| 50 | | max. | [kW] | | | | | | | | | |
| 51 | Srednia różnica temperatur | | [°C] | | | | | | | | | |
| 52 | Ekstremalne warunki przyjęte dla doboru wymiennika: | | | | | | | | | | | |
| 53 | Temperatura ścianki płaszcz | | | | °C | | | | | | | |
| 54 | Temperatura ścianki rurek | | | | °C | | | | | | | |
| 55 | UWAGI: | *) Wypełnia dostawca | | | | | | | | | | |
| 56 | | 1) Rysunek technologiczny według załącznika | | | | | | | | | | |
| 57 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 59 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |
| 61 | | | | | | | | | | | | |
| 62 | | | | | | | | | | | | |
| 63 | | | | | | | | | | | | |
| 64 | | Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | | | | |
| 65 | | Rewizja: | 0 | 1 | | | | | | | | |
| 66 | | Data: | mar.23 | | | | | | | | | |
| 67 | | Podpis: | | | | | | | | | | |
| 68 | | UWAGI: | | | | | | | | | | |
| 69 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | |

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PLASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|--|--|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | <input type="checkbox"/> Tylko kupującego | | |
| | Jed.miary | STRONA PLASZCZA | STRONA RUREK | |
| Projektowe nadciśnienie | [bar] | 16 | 16 | |
| Projektowa temperatura | [°C] | 200 | 200 | |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|------------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Plaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dna sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie plaszcza: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 80 |
| Plaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwalcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

WYPEŁNIENIE

| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

UWAGI OGOLNE

*) Wypełnia dostawca

X - Odległość (wysokość) od bazy

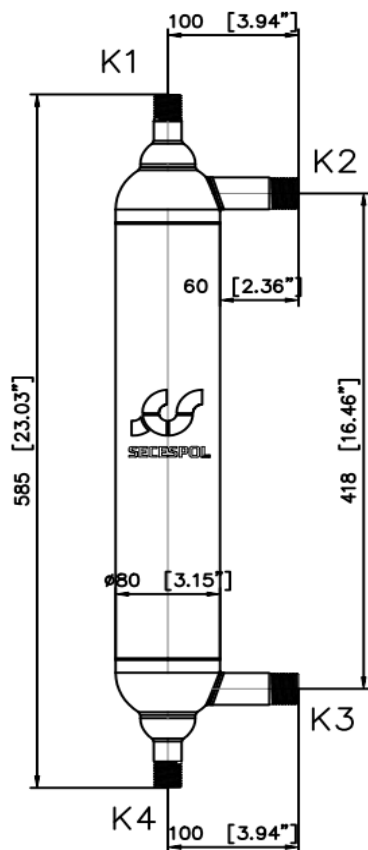
Y - Odległość (długość) od osi głównej

Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca

| | | | | | | | | | |
|--|----------|--------|---|--|--|--|--|--|--|
| | Rewizja: | 0 | 1 | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| | UWAGI: | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|---|--|--|--|--|--|--|--|
| Rewizja: | 0 | 1 | | | | | | | |
| Data: | mar.23 | | | | | | | | |
| Podpis: | | | | | | | | | |
| UWAGI: | | | | | | | | | |

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PLASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|--|--|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | <input type="checkbox"/> Tylko kupującego | | |
| | Jed.miary | STRONA PLASZCZA | STRONA RUREK | |
| Projektowe nadciśnienie | [bar] | 16 | 16 | |
| Projektowa temperatura | [°C] | 200 | 200 | |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|------------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Plaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dna sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie plaszcza: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 80 |
| Plaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwalcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

WYPEŁNIENIE

| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

UWAGI OGOLNE

*) Wypełnia dostawca

X - Odległość (wysokość) od bazy

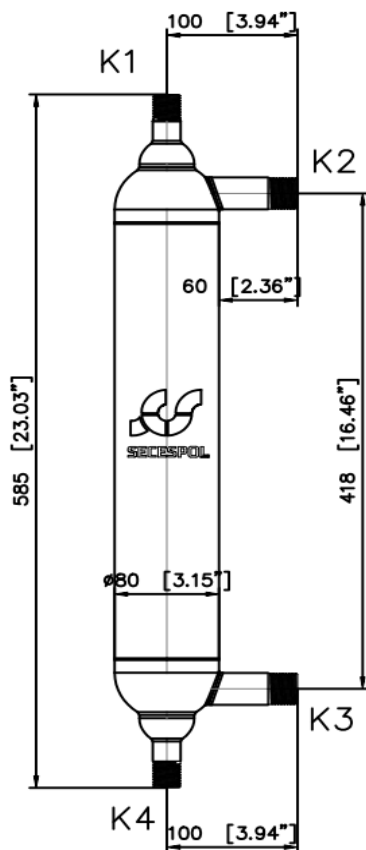
Y - Odległość (długość) od osi głównej

Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca

| | | | | | | | | | |
|--|----------|--------|---|--|--|--|--|--|--|
| | Rewizja: | 0 | 1 | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| | UWAGI: | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|---|--|--|--|--|--|--|--|
| Rewizja: | 0 | 1 | | | | | | | |
| Data: | mar.23 | | | | | | | | |
| Podpis: | | | | | | | | | |
| UWAGI: | | | | | | | | | |

| | | | | | | | | | | | |
|---|--|--|-------------------|----------------|----------------------------------|-------|-------------------|---------------|------------------|-------|--|
| | WYMIENNIK CIEPŁA PŁASZCZOWO-RUROWY SPECYFIKACJA TECHNICZNA / DATASHEET | | | | | | | | | | |
| OGÓLNE | | | | | | | | | | | |
| Numer technologiczny | | 36E-7 | | | | | | | | | |
| Ilość | | 1 | | | | | | | | | |
| Przeznaczenie | | Skrapacz kolumny destylacyjnej 36C-3 | | | | | | | | | |
| Producent | | HEXONIC | | | | | | | | | |
| Rysunek | | wg katalogu | | | | | | | | | |
| Wymiar | | 585 mm | | | | | | | | | |
| Typ | | <input checked="" type="checkbox"/> Poziomy | | | <input type="checkbox"/> Pionowy | | | Model: H0K | | | |
| Podłączone do / z | | Z kolumny destylacyjnej 36C-3 do zbiornika 36V-7 | | | | | | | | | |
| Powierzchnia / Jednostka | | [m²] | | 0,3 | | | | | | | |
| Płaszcz / Jednostka | | | | | | | | | | | |
| Powierzchnia / Płaszcz | | [m²] | | | | | | | | | |
| DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU | | | | | | | | | | | |
| | | Jednostki miary | | STRONA ZIMNA | | | | STRONA GORĄCA | | | |
| | | | | Wlot | | Wylot | | Wlot | | Wylot | |
| Nazwa medium | | | | woda chłodząca | | | | Metanol, DMC | | | |
| Całkowita ilość medium | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Opary | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Ciecz | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Para | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Związki niekondensujące | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Odparowana ciecz | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Skroplona para | norm. | [kg/h] | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | |
| Temperatura robocza | norm. | [°C] | 25 | | 30 | | 90 | | 64 | | |
| | max. | [°C] | | | | | | | | | |
| Ciśnienie robocze | norm. | [bar] | 2,5 | | 2,5 | | 0,3 | | 0,3 | | |
| | max. | [bar] | | | | | | | | | |
| Gęstość | | [kg/m³] | 997 dla 25 [°C] | | 992 dla 40 [°C] | | 724 dla 90 [°C] | | 750 dla 64 [°C] | | |
| Lepkość | | [cP] | 0,89 dla 25 [°C] | | 0,65 dla 40 [°C] | | 0,26 dla 90 [°C] | | 0,35 dla 64 [°C] | | |
| Ciepło właściwe | | [kJ/kg·°C] | 4178 dla 25 [°C] | | 4175 dla 40 [°C] | | 3,03 dla 90 [°C] | | 2,76 dla 64 [°C] | | |
| Przewodność cieplna | | [W/m·°C] | 0,606 dla 25 [°C] | | 0,633 dla 40 [°C] | | 0,199 dla 90 [°C] | | 0,2 dla 64 [°C] | | |
| Ciepło przemiany faz | | [kJ/kg] | 2257 | | 2257 | | | | | | |
| Masa cząsteczkowa | | [g/mol] | 18,016 | | 18,016 | | | | | | |
| Drogi / płaszcz | | ilość | 1 | | | | 1 | | | | |
| Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | | |
| Prędkość przepływu | norm. | [m/s] | | | | | | | | | |
| | max. | [m/s] | | | | | | | | | |
| Spadek ciśnienia | norm. | [bar] | | | | | | | | | |
| | max. | [bar] | | | | | | | | | |
| Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | | | bez osadu | | |
| | max. | [W/m²·°C] | | | | | | | bez osadu | | |
| Wymienione ciepło | norm. | [kW] | | | | | | | | | |
| | max. | [kW] | | | | | | | | | |
| Średnia różnica temperatur | | [°C] | | | | | | | | | |
| Ekstremalne warunki przyjęte dla doboru wymiennika: | | | | | | | | | | | |
| Temperatura ścianki płaszcz | | °C | | | | | | | | | |
| Temperatura ścianki rurek | | °C | | | | | | | | | |
| UWAGI: | *) Wypełnia dostawca | | | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | | Rewizja: | 0 | 1 | | | | | | | |
| | | Data: | mar.23 | | | | | | | | |
| | | Podpis: | | | | | | | | | |
| | | UWAGI: | | | | | | | | | |

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PLASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|--|--|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | <input type="checkbox"/> Tylko kupującego | | |
| | Jed.miary | STRONA PLASZCZA | STRONA RUREK | |
| Projektowe nadciśnienie | [bar] | 16 | 16 | |
| Projektowa temperatura | [°C] | 200 | 200 | |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|-----------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Plaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dno sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie płaszcz: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 80 |
| Plaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwałcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

WYPEŁNIENIE

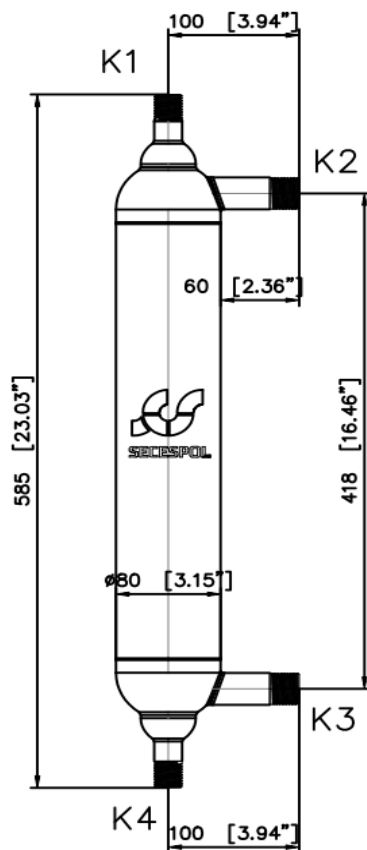
| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

UWAGI OGOLNE

| | | | | | | | | | |
|--|----------|--------|---|--|--|--|--|--|--|
| *) Wypełnia dostawca | | | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | Rewizja: | 0 | 1 | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| UWAGI: | | | | | | | | | |

SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | |
|----------|--------|---|--|--|--|--|--|--|
| Rewizja: | 0 | 1 | | | | | | |
| Data: | mar.23 | | | | | | | |
| Podpis: | | | | | | | | |

UWAGI:

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

OGÓLNE

| | | | | |
|--------------------------|---|----------------------------------|------------|--|
| Numer technologiczny | 36E-8 | | | |
| Ilość | 1 | | | |
| Przeznaczenie | Chłodnica destylatu z 36C-3 | | | |
| Producent | HEXONIC | | | |
| Rysunek | wg katalogu | | | |
| Wymiar | 585 mm | | | |
| Typ | <input checked="" type="checkbox"/> Poziomy | <input type="checkbox"/> Pionowy | Model: H0K | |
| Podłączone do / z | Ze zbiornika 36V-7 do zbiornika 36V-10 | | | |
| Powierzchnia / Jednostka | [m²] | 0,3 | | |
| Płaszcz / Jednostka | | | | |
| Powierzchnia / Płaszcz | [m²] | | | |

DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU

| | | Jednostki | STRONA ZIMNA | | | | | | STRONA GORĄCA | | | | | | | | | |
|---------------------------------|-------|------------|----------------|-----|----|--------|-------|-----|---------------|------|------|-------|----|------|------|-----|----|------|
| | | miary | Wlot | | | Wylot | | | Wlot | | | Wylot | | | | | | |
| Nazwa medium | | | woda chłodząca | | | | | | Metanol, DMC | | | | | | | | | |
| Całkowita ilość medium | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Opary | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Ciecz | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Para | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Związki niekondensujące | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Odparowana ciecz | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Skroplona para | norm. | [kg/h] | | | | | | | | | | | | | | | | |
| | max. | [kg/h] | | | | | | | | | | | | | | | | |
| Temperatura robocza | norm. | [°C] | 25 | | | 30 | | | 64 | | | 30 | | | | | | |
| | max. | [°C] | | | | | | | | | | | | | | | | |
| Ciśnienie robocze | norm. | [bar] | 2,5 | | | 2,5 | | | 0,3 | | | 0,3 | | | | | | |
| | max. | [bar] | | | | | | | | | | | | | | | | |
| Gęstość | | [kg/m³] | 997 | dla | 25 | [°C] | 992 | dla | 40 | [°C] | 750 | dla | 64 | [°C] | 782 | dla | 30 | [°C] |
| Lepkość | | [cP] | 0,89 | dla | 25 | [°C] | 0,65 | dla | 40 | [°C] | 0,35 | dla | 64 | [°C] | 0,52 | dla | 30 | [°C] |
| Ciepło właściwe | | [kJ/kg·°C] | 4178 | dla | 25 | [°C] | 4175 | dla | 40 | [°C] | 2,76 | dla | 64 | [°C] | 2,54 | dla | 30 | [°C] |
| Przewodność cieplna | | [W/m·°C] | 0,606 | dla | 25 | [°C] | 0,633 | dla | 40 | [°C] | 0,2 | dla | 64 | [°C] | 0,2 | dla | 30 | [°C] |
| Ciepło przemiany faz | | [kJ/kg] | 2257 | | | 2257 | | | | | | | | | | | | |
| Masa cząsteczkowa | | [g/mol] | 18,016 | | | 18,016 | | | | | | | | | | | | |
| Drogi / płaszcz | | ilość | 1 | | | | | | 1 | | | | | | | | | |
| Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | | | | | | | | | |
| Prędkość przepływu | norm. | [m/s] | | | | | | | | | | | | | | | | |
| | max. | [m/s] | | | | | | | | | | | | | | | | |
| Spadek ciśnienia | norm. | [bar] | | | | | | | | | | | | | | | | |
| | max. | [bar] | | | | | | | | | | | | | | | | |
| Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | | | bez osadu | | | | | | | | | |
| | max. | [W/m²·°C] | | | | | | | bez osadu | | | | | | | | | |
| Wymienione ciepło | norm. | [kW] | | | | | | | | | | | | | | | | |
| | max. | [kW] | | | | | | | | | | | | | | | | |
| Średnia różnica temperatur | | [°C] | | | | | | | | | | | | | | | | |

Ekstremalne warunki przyjęte dla doboru wymiennika:

| | |
|-----------------------------|----|
| Temperatura ścianki płaszcz | °C |
| Temperatura ścianki rurek | °C |

| | | | | | | | | | |
|-----------------------------|---|--------------------------------|--------|--|--|--|--|--|--|
| UWAGI: | *) Wypełnia dostawca | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | |
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| | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | |
| | | Rewizja: | 0 | | | | | | |
| | | Data: | mar.23 | | | | | | |
| | | Podpis: | | | | | | | |
| | | UWAGI: | | | | | | | |
| | | | | | | | | | |

WYMIENNIK CIEPŁA

PLASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

DANE PROJEKTOWE DLA JEDNEGO PLASZCZA

| | | | | |
|-------------------------|---------------------------------------|---|--|--|
| Przepisy projektowe | <input type="checkbox"/> DT-UC-90/WO | <input checked="" type="checkbox"/> PED | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | <input type="checkbox"/> Kupującego i | <input type="checkbox"/> Tylko kupującego | | |
| | Jed.miary | STRONA PLASZCZA | STRONA RUREK | |
| Projektowe nadciśnienie | [bar] | 16 | 16 | |
| Projektowa temperatura | [°C] | 200 | 200 | |
| Nadciśnienie próbne | [bar] | | | |
| Typ próby | | | | |
| Współ.jakości spoin | [%] | | | |
| Badanie radiograficzne | [%] | | | |
| Naddatek na korozję | [mm] | | | |

MATERIAŁ

| | | | |
|-----------------------------|--------|----------------------------|--------|
| Rurki | 1.4404 | Pokrywy komór | |
| Plaszcz | 1.4404 | Pokrywa głowicy pływającej | |
| Komory | 1.4404 | Kołnierze korpusu | |
| Dna sitowe | 1.4404 | Sruby/Nakrętki | |
| Przegrody | 1.4404 | Uszczelki | |
| Płyty uderzeniowe | 1.4404 | Podpory | |
| Króćce: po stronie płaszcz: | 1.4404 | Króćce: po stronie rurek: | 1.4404 |
| kołnierze | | kołnierze | |
| rury | 1.4404 | rury | 1.4404 |
| uszczelki | Teflon | uszczelki | Teflon |
| śruby/nakrętki | | śruby/nakrętki | |

WYMIARY

| | | |
|-------------------------|---|-------------|
| | Ilość sztuk | wg katalogu |
| | O D [mm] | 8 |
| Rurki | Grubość [mm] | |
| | Długość [mm] | |
| | Podziałka | |
| | O D [mm] | 80 |
| Plaszcz | I D [mm] | |
| | Grubość [mm] | |
| Połącz: Rura/Dno sitowe | <input type="checkbox"/> Spawane i rozwałcowane | |

DANE ROZNE

| | | | |
|--|---|---|-----------------------|
| Przegrody | <input type="checkbox"/> Wzdłużne | <input type="checkbox"/> Poprzeczne | |
| Płyty uderzeniowe | <input type="checkbox"/> Wlot | <input type="checkbox"/> Wylot | |
| Lokalizacja | <input checked="" type="checkbox"/> W budynku | <input type="checkbox"/> Poza budynkiem | |
| Izolacja | <input checked="" type="checkbox"/> Tak | <input type="checkbox"/> Nie | Grubość izolacji [mm] |
| Zabezpieczenie powierzchni wewnętrznej | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | |
| Masa pustego wymiennika | 7,1 | [kg] | |
| Masa awaryjna | | [kg] | |
| Masa wiązki rurek | | [kg] | |

WYKAZ KROCCOW

| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
|--------|-----------------------|------------------|-----------------------|-----------------------|--------|--------|-------|
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
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| | | | | | | | |

WYPEŁNIENIE

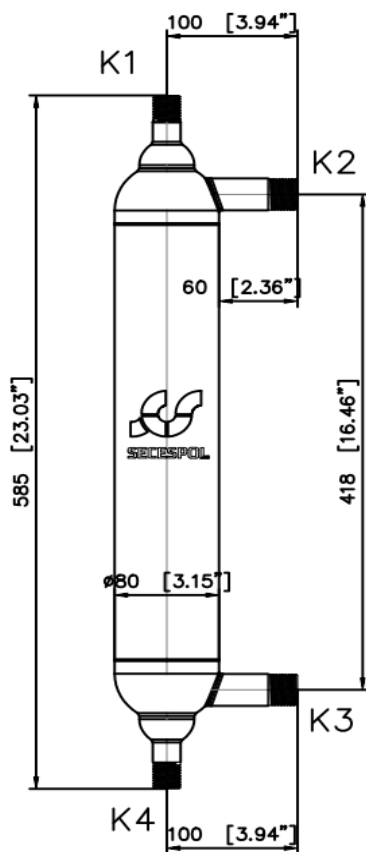
| | | | | |
|-------------|------------------------------------|--|--------------------------------|--|
| Wypełnienie | <input type="checkbox"/> Mieszadło | <input type="checkbox"/> Przegrody | <input type="checkbox"/> Półki | <input type="checkbox"/> Płyty rozdzielające |
| | <input type="checkbox"/> Wężownica | <input checked="" type="checkbox"/> Wiązka rur | | |

UWAGI OGOLNE

| | | | | | | | | | |
|--|----------|--------|--|--|--|--|--|--|--|
| *) Wypełnia dostawca | | | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | | | |
| | Rewizja: | 0 | | | | | | | |
| | Data: | mar.23 | | | | | | | |
| | Podpis: | | | | | | | | |
| UWAGI: | | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



| | | | | | | | | | |
|----------|--------|--|--|--|--|--|--|--|--|
| Rewizja: | 0 | | | | | | | | |
| Data: | mar.23 | | | | | | | | |
| Podpis: | | | | | | | | | |
| UWAGI: | | | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

OGÓLNE

| | | | | |
|--------------------------|--|----------------------------------|------------|--|
| Numer technologiczny | 36E-9 | | | |
| Ilość | 1 | | | |
| Przeznaczenie | Chłodnica węgla dimetylu | | | |
| Producent | HEXONIC | | | |
| Rysunek | wg katalogu | | | |
| Wymiar | 585 mm | | | |
| Typ | <input checked="" type="checkbox"/> Poziomy | <input type="checkbox"/> Pionowy | Model: H0K | |
| Podłączone do / z | Z kolumny destylacyjnej 36C-3 do zbiornika 36V-8 | | | |
| Powierzchnia / Jednostka | [m²] | 0,3 | | |
| Płaszcz / Jednostka | | | | |
| Powierzchnia / Płaszcz | [m²] | | | |

DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU

| | | Jednostki miary | STRONA ZIMNA | | | | STRONA GORĄCA | | | |
|---------------------------------|-------|-----------------|-------------------|--|-------------------|--|-------------------|--|----------|--|
| | | | Wlot | | Wylot | | Wlot | | Wylot | |
| Nazwa medium | | | woda chłodząca | | | | Węglan dimetylu | | | |
| Całkowita ilość medium | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Opary | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Ciecz | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Para | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Związki niekondensujące | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Odparowana ciecz | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Skroplona para | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Temperatura robocza | norm. | [°C] | 25 | | 30 | | 90 | | 30 | |
| | max. | [°C] | | | | | | | | |
| Ciśnienie robocze | norm. | [bar] | 2,5 | | 2,5 | | 0,3 | | 0,3 | |
| | max. | [bar] | | | | | | | | |
| Gęstość | | [kg/m³] | 997 dla 25 [°C] | | 992 dla 40 [°C] | | 1070 dla 25 [°C] | | dla [°C] | |
| Lepkość | | [cP] | 0,89 dla 25 [°C] | | 0,65 dla 40 [°C] | | 0,664 dla 20 [°C] | | dla [°C] | |
| Ciepło właściwe | | [kJ/kg·°C] | 4178 dla 25 [°C] | | 4175 dla 40 [°C] | | dla 90 [°C] | | dla [°C] | |
| Przewodność cieplna | | [W/m·°C] | 0,606 dla 25 [°C] | | 0,633 dla 40 [°C] | | dla 90 [°C] | | dla [°C] | |
| Ciepło przemiany faz | | [kJ/kg] | 2257 | | 2257 | | | | | |
| Masa cząsteczkowa | | [g/mol] | 18,016 | | 18,016 | | | | | |
| Drogi / płaszcz | | ilość | 1 | | | | 1 | | | |
| Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | |
| Prędkość przepływu | norm. | [m/s] | | | | | | | | |
| | max. | [m/s] | | | | | | | | |
| Spadek ciśnienia | norm. | [bar] | | | | | | | | |
| | max. | [bar] | | | | | | | | |
| Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | bez osadu | | | |
| | max. | [W/m²·°C] | | | | | bez osadu | | | |
| Wymienione ciepło | norm. | [kW] | | | | | | | | |
| | max. | [kW] | | | | | | | | |
| Średnia różnica temperatur | | [°C] | | | | | | | | |

Ekstremalne warunki przyjęte dla doboru wymiennika:

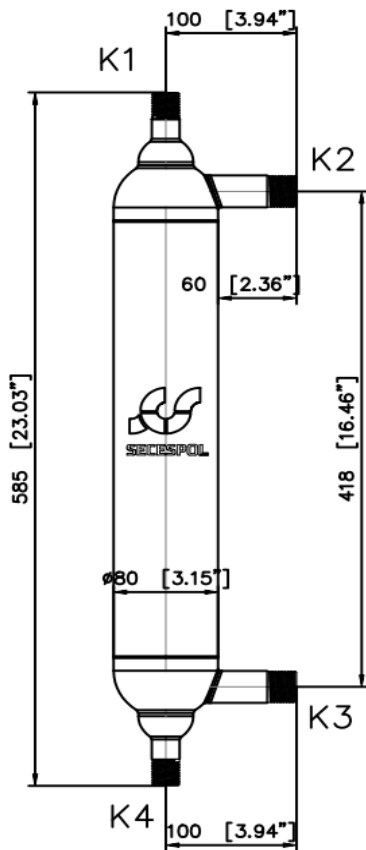
| | |
|------------------------------|----|
| Temperatura ścianki płaszczu | °C |
| Temperatura ścianki rurek | °C |

| | | | | | | | | | | |
|-----------------------------|---|--------------------------------|--------|--|--|--|--|--|--|--|
| UWAGI: | *) Wypełnia dostawca | | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | | |
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| | | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | | |
| | | Rewizja: | 0 | | | | | | | |
| | | Data: | mar.23 | | | | | | | |
| | | Podpis: | | | | | | | | |
| | | UWAGI: | | | | | | | | |

| | | | | | | | |
|--|-----------------------|--|-----------------------|--|--------|--|-------|
| | | <div>WYMIENNIK CIEPŁA</div> <div>PLASZCZOWO-RUROWY</div> | | | | | |
| SPECYFIKACJA TECHNICZNA / DATASHEET | | | | | | | |
| DANE PROJEKTOWE DLA JEDNEGO PLASZCZA | | | | | | | |
| Przepisy projektowe | | <input type="checkbox"/> DT-UC-90/WO | | <input checked="" type="checkbox"/> PED | | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | | <input type="checkbox"/> Kupującego i | | <input type="checkbox"/> Tylko kupującego | | | |
| | | Jed.miary | STRONA PLASZCZA | | | STRONA RUREK | |
| Projektowe nadciśnienie | | [bar] | 16 | | | 16 | |
| Projektowa temperatura | | [°C] | 200 | | | 200 | |
| Nadciśnienie próbne | | [bar] | | | | | |
| Typ próby | | | | | | | |
| Współ.jakości spoin | | [%] | | | | | |
| Badanie radiograficzne | | [%] | | | | | |
| Naddatek na korozję | | [mm] | | | | | |
| MATERIAŁ | | | | | | | |
| Rurki | | | 1.4404 | Pokrywy komór | | | |
| Płaszcz | | | 1.4404 | Pokrywa głowicy pływającej | | | |
| Komory | | | 1.4404 | Kołnierze korpusu | | | |
| Dno sitowe | | | 1.4404 | Śruby/Nakrętki | | | |
| Przegrody | | | 1.4404 | Uszczelki | | | |
| Płyty uderzeniowe | | | 1.4404 | Podpory | | | |
| Króćce: po stronie płaszcza: | | | 1.4404 | Króćce: po stronie rurek: | | 1.4404 | |
| kołnierze | | | | kołnierze | | | |
| rury | | | 1.4404 | rury | | 1.4404 | |
| uszczelki | | | Teflon | uszczelki | | Teflon | |
| śruby/nakrętki | | | | śruby/nakrętki | | | |
| WYMIARY | | | | | | | |
| Rurki | | Ilość sztuk | wg katalogu | | | | |
| | | O D [mm] | 8 | | | | |
| | | Grubość [mm] | | | | | |
| | | Długość [mm] | | | | | |
| | | Podziałka | | | | | |
| Płaszcz | | O D [mm] | 80 | | | | |
| | | I D [mm] | | | | | |
| | | Grubość [mm] | | | | | |
| Połącz: Rura/Dno sitowe | | <input type="checkbox"/> Spawane i rozwalcowane | | | | | |
| DANE ROZNE | | | | | | | |
| Przegrody | | <input type="checkbox"/> Wzdłużne | | <input type="checkbox"/> Poprzeczne | | | |
| Płyty uderzeniowe | | <input type="checkbox"/> Wlot | | <input type="checkbox"/> Wylot | | | |
| Lokalizacja | | <input checked="" type="checkbox"/> W budynku | | <input type="checkbox"/> Poza budynkiem | | | |
| Izolacja | | <input checked="" type="checkbox"/> Tak | | <input type="checkbox"/> Nie | | Grubość izolacji [mm] | |
| Zabezpieczenie powierzchni wewnętrznej | | | | | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | | | | | |
| Masa pustego wymiennika | | 7,1 | [kg] | | | | |
| Masa awaryjna | | | [kg] | | | | |
| Masa wiązki rurek | | | [kg] | | | | |
| WYKAZ KROCCOW | | | | | | | |
| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| WYPEŁNIENIE | | | | | | | |
| Wypełnienie | | <input type="checkbox"/> Mieszadło | | <input type="checkbox"/> Przegrody | | <input type="checkbox"/> Półki | |
| | | <input type="checkbox"/> Wężownica | | <input checked="" type="checkbox"/> Wiązka rur | | | |
| UWAGI OGOLNE | | | | | | | |
| *) Wypełnia dostawca | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | |
| | | Rewizja: | 0 | | | | |
| | | Data: | mar.23 | | | | |
| | | Podpis: | | | | | |
| | | UWAGI: | | | | | |
| | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



Rewizja:

0

Data:

mar.23

Podpis:

UWAGI:

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY

SPECYFIKACJA TECHNICZNA / DATASHEET

OGÓLNE

| | | | | | |
|--------------------------|---|----------------------------------|------------|--|--|
| Numer technologiczny | 36E-10 | | | | |
| Ilość | 1 | | | | |
| Przeznaczenie | Chłodnica cieczy wyczerpanej z 36C-1 | | | | |
| Producent | HEXONIC | | | | |
| Rysunek | wg katalogu | | | | |
| Wymiar | 585 mm | | | | |
| Typ | <input checked="" type="checkbox"/> Poziomy | <input type="checkbox"/> Pionowy | Model: H0K | | |
| Podłączone do / z | Ze zbiornika V-4 do zbiornika V-10 | | | | |
| Powierzchnia / Jednostka | [m ²] | 0,3 | | | |
| Płaszcz / Jednostka | | | | | |
| Powierzchnia / Płaszcz | [m ²] | | | | |

DANE ROBOCZE / RUCHOWE DLA JEDNEGO ZESTAWU

| | | Jednostki miary | STRONA ZIMNA | | | | STRONA GORĄCA | | | |
|---------------------------------|-------|-----------------|----------------|-------------|--------|-------------|---------------------------------|--------------|-------|----------|
| | | | Wlot | | Wylot | | Wlot | | Wylot | |
| Nazwa medium | | | Woda chłodząca | | | | Glikol etylenowy, metanol, NaOH | | | |
| Całkowita ilość medium | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Opary | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Ciecz | norm. | [kg/h] | 250 | | 250 | | 10 | | 10 | |
| | max. | [kg/h] | | | | | | | | |
| Para | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Związki niekondensujące | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Odparowana ciecz | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Skroplona para | norm. | [kg/h] | | | | | | | | |
| | max. | [kg/h] | | | | | | | | |
| Temperatura robocza | norm. | [°C] | 25 | | 30 | | 110 | | 90 | |
| | max. | [°C] | | | | | | | | |
| Ciśnienie robocze | norm. | [bar] | 2,5 | | 2,5 | | 0,3 | | 0,3 | |
| | max. | [bar] | | | | | | | | |
| Gęstość | | [kg/m³] | 997 | dla 25 [°C] | 992 | dla 40 [°C] | 1050 | dla 110 [°C] | | dla [°C] |
| Lepkość | | [cP] | 0,89 | dla 25 [°C] | 0,65 | dla 40 [°C] | 0,35 | dla 64 [°C] | | dla [°C] |
| Ciepło właściwe | | [kJ/kg·°C] | 4178 | dla 25 [°C] | 4175 | dla 40 [°C] | 2,76 | dla 64 [°C] | | dla [°C] |
| Przewodność cieplna | | [W/m·°C] | 0,606 | dla 25 [°C] | 0,633 | dla 40 [°C] | 0,2 | dla 64 [°C] | | dla [°C] |
| Ciepło przemiany faz | | [kJ/kg] | 2257 | | 2257 | | | | | |
| Masa cząsteczkowa | | [g/mol] | 18,016 | | 18,016 | | | | | |
| Drogi / płaszcz | | ilość | 1 | | | | 1 | | | |
| Współczynnik oporu cieplnego | | [m²·°C/W] | | | | | | | | |
| Prędkość przepływu | norm. | [m/s] | | | | | | | | |
| | max. | [m/s] | | | | | | | | |
| Spadek ciśnienia | norm. | [bar] | | | | | | | | |
| | max. | [bar] | | | | | | | | |
| Współczynnik przenikania ciepła | norm. | [W/m²·°C] | | | | | bez osadu | | | |
| | max. | [W/m²·°C] | | | | | bez osadu | | | |
| Wymienione ciepło | norm. | [kW] | | | | | | | | |
| | max. | [kW] | | | | | | | | |
| Średnia różnica temperatur | | [°C] | | | | | | | | |

Ekstremalne warunki przyjęte dla doboru wymiennika:

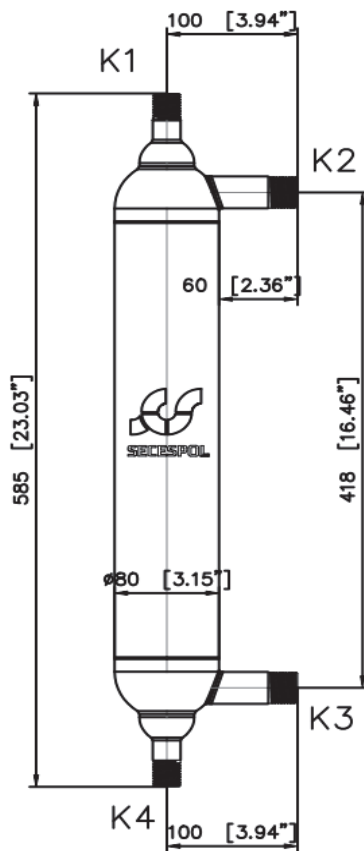
| | |
|-----------------------------|----|
| Temperatura ścianki płaszcz | °C |
| Temperatura ścianki rurek | °C |

| | | | | | | | | | | |
|-----------------------------|---|--------------------------------|--------|--------|--|--|--|--|--|--|
| UWAGI: | *) Wypełnia dostawca | | | | | | | | | |
| | 1) Rysunek technologiczny według załącznika | | | | | | | | | |
| | | | | | | | | | | |
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| | | | | | | | | | | |
| Uwagi (*) uzupełni Dostawca | | Uwagi (**) potwierdzi Dostawca | | | | | | | | |
| | | Rewizja: | 0 | 1 | | | | | | |
| | | Data: | mar.23 | wrz.23 | | | | | | |
| | | Podpis: | | | | | | | | |
| | | UWAGI: | | | | | | | | |

| | | | | | | | |
|--|-----------------------|---|-----------------------|--|--------|--|-------|
| | | <div>WYMIENNIK CIEPŁA</div> <div>PLASZCZOWO-RUROWY</div> <div>SPECYFIKACJA TECHNICZNA / DATASHEET</div> | | | | | |
| DANE PROJEKTOWE DLA JEDNEGO PLASZCZA | | | | | | | |
| Przepisy projektowe | | <input type="checkbox"/> DT-UC-90/WO | | <input checked="" type="checkbox"/> PED | | <input type="checkbox"/> ASME TEMA Class | |
| Odbiór | | <input type="checkbox"/> Kupującego i | | <input type="checkbox"/> Tylko kupującego | | | |
| | | Jed.miary | STRONA PLASZCZA | | | STRONA RUREK | |
| Projektowe nadciśnienie | | [bar] | 16 | | | 16 | |
| Projektowa temperatura | | [°C] | 200 | | | 200 | |
| Nadciśnienie próbne | | [bar] | | | | | |
| Typ próby | | | | | | | |
| Współ.jakości spoin | | [%] | | | | | |
| Badanie radiograficzne | | [%] | | | | | |
| Naddatek na korozję | | [mm] | | | | | |
| MATERIAŁ | | | | | | | |
| Rurki | | | 1.4404 | Pokrywy komór | | | |
| Plaszcz | | | 1.4404 | Pokrywa głowicy pływającej | | | |
| Komory | | | 1.4404 | Kołnierze korpusu | | | |
| Dna sitowe | | | 1.4404 | Śruby/Nakrętki | | | |
| Przegrody | | | 1.4404 | Uszczelki | | | |
| Płyty uderzeniowe | | | 1.4404 | Podpory | | | |
| Króćce: po stronie płaszcz: | | | 1.4404 | Króćce: po stronie rurek: | | 1.4404 | |
| kołnierze | | | | kołnierze | | | |
| rury | | | 1.4404 | rury | | 1.4404 | |
| uszczelki | | | Teflon | uszczelki | | Teflon | |
| śruby/nakrętki | | | | śruby/nakrętki | | | |
| WYMIARY | | | | | | | |
| Ilość sztuk | | wg katalogu | | | | | |
| O D [mm] | | 8 | | | | | |
| Grubość [mm] | | | | | | | |
| Długość [mm] | | | | | | | |
| Podziałka | | | | | | | |
| O D [mm] | | 80 | | | | | |
| I D [mm] | | | | | | | |
| Grubość [mm] | | | | | | | |
| Połącz: Rura/Dno sitowe | | <input type="checkbox"/> Spawane i rozwalcowane | | | | | |
| DANE ROZNE | | | | | | | |
| Przegrody | | <input type="checkbox"/> Wzdłużne | | <input type="checkbox"/> Poprzeczne | | | |
| Płyty uderzeniowe | | <input type="checkbox"/> Wlot | | <input type="checkbox"/> Wylot | | | |
| Lokalizacja | | <input checked="" type="checkbox"/> W budynku | | <input type="checkbox"/> Poza budynkiem | | | |
| Izolacja | | <input checked="" type="checkbox"/> Tak | | <input type="checkbox"/> Nie | | Grubość izolacji [mm] | |
| Zabezpieczenie powierzchni wewnętrznej | | | | | | | |
| Zabezpieczenie powierzchni zewnętrznej | | | | | | | |
| Masa pustego wymiennika | | 7,1 | [kg] | | | | |
| Masa awaryjna | | | [kg] | | | | |
| Masa wiązki rurek | | | [kg] | | | | |
| WYKAZ KROCCOW | | | | | | | |
| Symbol | Przeznaczenie | Srednica DN [mm] | Ciśn. nomin. PN [bar] | Norma kołn. / przyłgi | X [mm] | Y [mm] | Uwagi |
| K1 | Wlot wody chłodzącej | DN15 | | | | | |
| K2 | Wylot medium | DN20 | | | | | |
| K3 | Wlot medium | DN20 | | | | | |
| K4 | Wylot wody chłodzącej | DN15 | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| WYPEŁNIENIE | | | | | | | |
| Wypełnienie | | <input type="checkbox"/> Mieszadło | | <input type="checkbox"/> Przegrody | | <input type="checkbox"/> Półki | |
| | | <input type="checkbox"/> Wężownica | | <input checked="" type="checkbox"/> Wiązka rur | | | |
| UWAGI OGOLNE | | | | | | | |
| *) Wypełnia dostawca | | | | | | | |
| X - Odległość (wysokość) od bazy | | | | | | | |
| Y - Odległość (długość) od osi głównej | | | | | | | |
| Uwagi (*) uzupełni Dostawca Uwagi (**) potwierdzi Dostawca | | | | | | | |
| Rewizja: | | 0 | 1 | | | | |
| Data: | | mar.23 | wrz.23 | | | | |
| Podpis: | | | | | | | |
| UWAGI: | | | | | | | |

WYMIENNIK CIEPŁA
PŁASZCZOWO-RUROWY
SPECYFIKACJA TECHNICZNA / DATASHEET

ZAŁĄCZNIK:



Rewizja:

0

1

Data:

mar.23

wrz.23

Podpis:

UWAGI:

SI Units

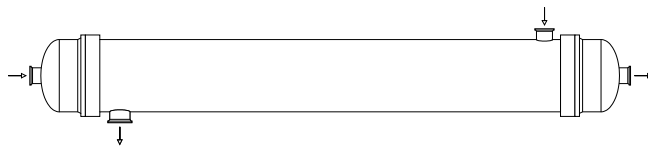
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | METANOL | | CW | |
| Fluid condition | | Cond. Vapor | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0131 | | 0,2345 |
| Weight fraction vapor, In/Out | (--) | 1,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 66,00 | 63,00 | 25,00 | 40,00 |
| Skin temperature, Min/Max | (Deg C) | 54,41 | 62,50 | 52,97 | 61,66 |
| Wall temperature, Min/Max | (Deg C) | 54,41 | 62,50 | 52,97 | 61,66 |
| Pressure, In/Average | (kPa) | 105,00 | 102,86 | 300,00 | 299,47 |
| Pressure drop, Total/Allowed | (kPa) | 4,275 | | 1,060 | |
| Velocity, Mid/Max allow | (m/s) | 1,38 | | 0,10 | |
| Mole fraction inert | (--) | | 0,0000 | | |
| Average film coef. | (W/m2-K) | | 3965,1 | | 950,73 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|--------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 579,27 | / | 650,24 | / | 650,24 |
| Heat duty, Calculated/Specified | (MegaWatts) | 0,0147 | / | | | |
| Effective overall temperature difference | (Deg C) | 31,5 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 31,52 | * | 1,0000 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 2,4 |
| Approximate tubeside (L) | 2,9 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 98,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,856 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,806 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 130,86 | / | 125,58 | / 6,68 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 611,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 44 |
| Overall length (m) | 0,650 | Pct tubes removed (both) | |
| Effective length (m) | 0,612 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 1,35

Flow fractions for vapor phase

B=0,9067 C=0,0933

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,949 | 0,920 | 1,031 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|-------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 0,60 | 0,06 | Inlet | 99,51 | 64,21 |
| MOMENTUM | | -0,18 | Outlet | 0,00 | 33,12 |

Two-Phase Parameters

| | | | | |
|--------|-------|---------|---------|--------|
| Method | Inlet | Center | Outlet | Mix F |
| RPM | Shear | Gravity | Gravity | 0,9549 |

H. T. Parameters

Shell

Tube

| | | |
|----------------------------|------|-------|
| Overall wall correction | | 1,000 |
| Midpoint Prandtl no. | | 5,05 |
| Midpoint Reynolds no. | 120 | 1120 |
| Bundle inlet Reynolds no. | 2569 | 951 |
| Bundle outlet Reynolds no. | 86 | 1276 |
| Fouling layer (mm) | | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 16,40 | 80,39 | 0,00 | 3,21 | 12,25 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | 1,88e-4 |

Shell Nozzles

| | | | |
|--------------------------|--------|--------|---------------|
| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
| Number at each position | 1 | 1 | 1 |
| Diameter (mm) | 15,799 | 20,930 | 20,930 |
| Velocity (m/s) | 54,27 | 0,00 | 5,03e-2 |
| Pressure drop (kPa) | 4,254 | 0,000 | 0,000 |
| Height under nozzle (mm) | 2,993 | 2,993 | 2,993 |
| Nozzle R-V-SQ (kg/m-s2) | 3614,3 | 0,00 | 1,91 |
| Shell ent. (kg/m-s2) | 4702,8 | 0,00 | |

Tube Nozzle

| | | | |
|-------------------------|--------|--------|---------------|
| | Inlet | Outlet | Liquid Outlet |
| | AXIAL | AXIAL | |
| Diameter (mm) | 15,799 | 15,799 | |
| Velocity (m/s) | 1,20 | 1,21 | |
| Pressure drop (kPa) | 0,681 | 0,351 | |
| Nozzle R-V-SQ (kg/m-s2) | 1435,1 | 1442,0 | |

Annular Distributor

Inlet

Outlet

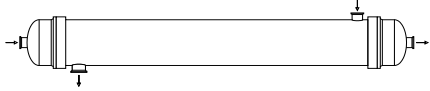
| | |
|-----------------|--|
| Length (mm) | |
| Height (mm) | |
| Slot area (mm2) | |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 2,6179 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|--|--|---|--|---|--|---|--|
| Service of Unit SKRAPLACZ 36C-1 | | | | Item No. 36E-2 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,856 / 0,806 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,856 / 0,806 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | Tube Side | | | |
| Fluid Name | | METANOL | | CW | | | |
| Fluid Quantity, Total kg/s | | 0,0131 | | 0,2345 | | | |
| Vapor (In/Out) wt% | | 100,00 0,00 | | 0,00 0,00 | | 100,00 100,00 | |
| Liquid wt% | | 0,00 100,00 | | 100,00 100,00 | | 100,00 100,00 | |
| Temperature (In/Out) C | | 66,00 63,00 | | 25,00 40,00 | | 40,00 40,00 | |
| Density kg/m3 | | 1,2271 754,15 | | 997,14 992,31 | | 992,31 992,31 | |
| Viscosity mN-s/m2 | | 0,0113 0,3433 | | 0,8900 0,6530 | | 0,6530 0,6530 | |
| Specific Heat kJ/kg-C | | 1,6922 2,8639 | | 4,1813 4,1781 | | 4,1781 4,1781 | |
| Thermal Conductivity W/m-C | | 0,0192 0,1892 | | 0,6076 0,6287 | | 0,6287 0,6287 | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 105,00 | | 300,00 | | | |
| Velocity m/s | | 1,38 | | 0,10 | | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 4,275 | | 0,000 1,060 | | 1,060 1,060 | |
| Average Film Coefficient W/m2-K | | 3965,1 | | 950,73 | | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | 0,000000 | | | |
| Heat Exchanged 0,0147 MegaWatts | | MTD (Corrected) 31,5 C | | Overdesign 12,25 % | | | |
| Transfer Rate, Service 579,27 W/m2-K | | Calculated 650,24 W/m2-K | | Clean 650,24 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | Sketch (Bundle/Nozzle Orientation) | | | |
| Design Pressure kPaG | | 517,11 | | 517,11 | |  | |
| Design Temperature C | | 98,89 | | 71,11 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 44,000 | | OD 9,525 mm | | Thk(Avg) 0,711 mm | | Length 0,650 m | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | Pitch 11,906 mm | | Tube pattern 30 | |
| Shell ID 98,000 mm | | Kettle ID mm | | Pairs seal strips 0 | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | Impingement Plate None | | | |
| Spacing(c/c) 611,90 mm | | Inlet mm | | No. of Crosspasses 1 | | | |
| Rho-V2-Inlet Nozzle 3614,3 kg/m-s2 | | Shell Entrance 4702,8 kg/m-s2 | | Shell Exit 0,00 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 125,58 kg | | Filled with Water 130,86 kg | | Bundle 6,68 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 16,40 | | Shellside 1,38 | | A | |
| | | Tube 80,39 | | Tubeside 0,10 | | B 0,907 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,093 | |
| | | Metal 3,21 | | Window 1,35 | | E | |
| | | | | | | F | |

SI Units

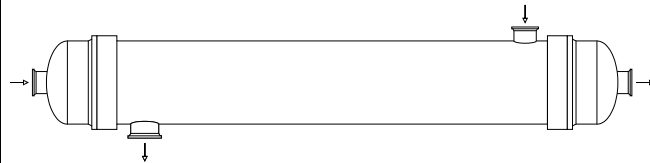
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | MEOH + DMC | | CW | |
| Fluid condition | | Sens. Liquid | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0139 | | 0,0353 |
| Weight fraction vapor, In/Out | (--) | 0,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 62,00 | 35,00 | 25,00 | 30,00 |
| Skin temperature, Min/Max | (Deg C) | 26,92 | 36,25 | 26,87 | 36,09 |
| Wall temperature, Min/Max | (Deg C) | 26,92 | 36,25 | 26,87 | 36,09 |
| Pressure, In/Average | (kPa) | 102,00 | 102,00 | 300,00 | 299,99 |
| Pressure drop, Total/Allowed | (kPa) | 7,85e-3 | | 0,028 | |
| Velocity, Mid/Max allow | (m/s) | 4,44e-3 | | 2,74e-2 | |
| Mole fraction inert | (--) | | | | |
| Average film coef. | (W/m2-K) | | 125,94 | | 567,66 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|---------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 148,85 | / | 99,40 | / | 99,40 |
| Heat duty, Calculated/Specified | (MegaWatts) | 7,37e-4 | / | | | |
| Effective overall temperature difference | (Deg C) | 16,1 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 18,97 | * | 0,8474 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|-------------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing | (mm) 411,90 | 1 | |
| Inlet spacing | (mm) 0,000 | 2 | |
| Outlet spacing | (mm) 0,000 | | |
| Baffle thickness | (mm) 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|------------------|------------------------------------|--------------------------|---------------------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length | (m) 0,450 | Pct tubes removed (both) | |
| Effective length | (m) 0,412 | Outside diameter | (mm) 9,525 |
| Total tubesheet | (mm) 38,100 | Wall thickness | (mm) 0,711 |
| Area ratio | (out/in) 1,1755 | Pitch (mm) | 11,906 Ratio 1,2500 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 4,84e-3

Flow fractions for heat transfer 0,765
B=0,6647 C=0,3353

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,884 | 0,920 | 0,961 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 1,90 | 0,22 | Inlet | 73,83 | 53,68 |
| MOMENTUM | | 0,00 | Outlet | 24,05 | 27,97 |

Two-Phase Parameters

| | | | | |
|--------|-------|--------|--------|-------|
| Method | Inlet | Center | Outlet | Mix F |
|--------|-------|--------|--------|-------|

H. T. Parameters

Shell Tube

| | | | |
|----------------------------|--|-------|-------|
| Overall wall correction | | 1,000 | 1,000 |
| Midpoint Prandtl no. | | 1,94 | 5,87 |
| Midpoint Reynolds no. | | 208 | 259 |
| Bundle inlet Reynolds no. | | 285 | 249 |
| Bundle outlet Reynolds no. | | 510 | 277 |
| Fouling layer (mm) | | | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 78,92 | 20,58 | 0,00 | 0,50 | -33,22 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | -0,003 |

Shell Nozzles

| | | | |
|--------------------------|---------|--------|---------------|
| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
| Number at each position | 1 | 1 | 1 |
| Diameter (mm) | 15,799 | 20,930 | 22,454 |
| Velocity (m/s) | 8,26e-2 | 0,00 | 3,90e-2 |
| Pressure drop (kPa) | 5,80e-3 | 0,000 | 1,89e-3 |
| Height under nozzle (mm) | 4,304 | 4,304 | 4,304 |
| Nozzle R-V-SQ (kg/m-s2) | 5,85 | 1,81 | 1,37 |
| Shell ent. (kg/m-s2) | 3,88 | 0,91 | |

Tube Nozzle

| | | | |
|-------------------------|--------|---------|---------------|
| | Inlet | Outlet | Liquid Outlet |
| | AXIAL | AXIAL | |
| Diameter (mm) | 15,799 | 15,799 | |
| Velocity (m/s) | 0,18 | 0,18 | |
| Pressure drop (kPa) | 0,015 | 7,80e-3 | |
| Nozzle R-V-SQ (kg/m-s2) | 32,43 | 32,47 | |

Annular Distributor

Inlet Outlet

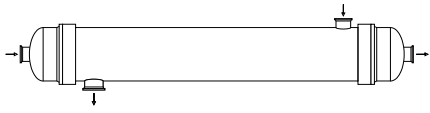
| | |
|-----------------|--|
| Length (mm) | |
| Height (mm) | |
| Slot area (mm2) | |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|---|--|---|--|---|--|---|--|
| Service of Unit CHŁODNICA DESTYLATU Z 36C-3 | | | | Item No. 36E-3 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | Tube Side | | | |
| Fluid Name | | MEOH + DMC | | CW | | | |
| Fluid Quantity, Total kg/s | | 0,0139 | | 0,0353 | | | |
| Vapor (In/Out) wt% | | 0,00 | | 0,00 | | 0,00 | |
| Liquid wt% | | 100,00 | | 100,00 | | 100,00 | |
| Temperature (In/Out) C | | 62,00 | | 35,00 | | 25,00 | |
| Density kg/m3 | | 857,70 | | 899,54 | | 997,14 | |
| Viscosity mN-s/m2 | | 0,1512 | | 0,0844 | | 0,8900 | |
| Specific Heat kJ/kg-C | | 1,9758 | | 1,9568 | | 4,1813 | |
| Thermal Conductivity W/m-C | | 0,1083 | | 0,1141 | | 0,6076 | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 102,00 | | 300,00 | | | |
| Velocity m/s | | | | 4,44e-3 | | 2,74e-2 | |
| Pressure Drop, Allow/Calc kPa | | 0,000 | | 7,85e-3 | | 0,000 | |
| Average Film Coefficient W/m2-K | | 125,94 | | 567,66 | | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | 0,000000 | | | |
| Heat Exchanged 7,37e-4 MegaWatts | | MTD (Corrected) 16,1 C | | Overdesign -33,22 % | | | |
| Transfer Rate, Service 148,85 W/m2-K | | Calculated 99,40 W/m2-K | | Clean 99,40 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | Sketch (Bundle/Nozzle Orientation) | | | |
| | | Shell Side | | Tube Side | |  | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 93,33 | | 60,00 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 25,000 | | OD 9,525 mm | | Thk(Avg) 0,711 mm | | Length 0,450 m | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | Pitch 11,906 mm | | Tube pattern 30 | |
| Shell ID 80,000 mm | | Kettle ID mm | | Pairs seal strips 0 | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | Impingement Plate None | | | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | No. of Crosspasses 1 | | | |
| Rho-V2-Inlet Nozzle 5,85 kg/m-s2 | | Shell Entrance 3,88 kg/m-s2 | | Shell Exit 0,91 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 78,92 | | Shellside 4,44e-3 | | A | |
| | | Tube 20,58 | | Tubeside 2,74e-2 | | B 0,665 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,335 | |
| | | Metal 0,50 | | Window 4,84e-3 | | E | |
| | | | | | | F | |

SI Units

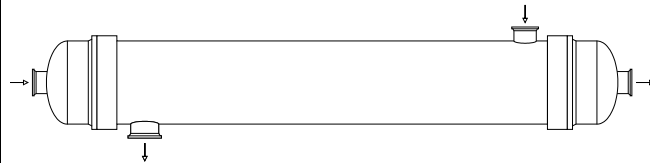
Rating - Horizontal Reflux Condenser - Shellside TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | METANOL | | CW | |
| Fluid condition | | Cond. Vapor | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 4,17e-4 | | 0,0139 |
| Weight fraction vapor, In/Out | (--) | 1,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 140,00 | 60,00 | 25,00 | 28,77 |
| Skin temperature, Min/Max | (Deg C) | 43,93 | 128,03 | 43,36 | 123,32 |
| Wall temperature, Min/Max | (Deg C) | 43,93 | 128,03 | 43,36 | 123,32 |
| Pressure, In/Average | (kPa) | 105,00 | 105,00 | 300,00 | 300,00 |
| Pressure drop, Total/Allowed | (kPa) | 1,45e-3 | | 5,25e-3 | |
| Velocity, Mid/Max allow | (m/s) | 1,29e-4 | | 1,08e-2 | |
| Mole fraction inert | (--) | | 0,0000 | | |
| Average film coef. | (W/m2-K) | | 1430,7 | | 1051,0 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|---------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 12,04 | / | 536,78 | / | 536,78 |
| Heat duty, Calculated/Specified | (MegaWatts) | 2,19e-4 | / | | | |
| Effective overall temperature difference | (Deg C) | 59,0 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 92,47 | * | 0,6379 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 411,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length (m) | 0,450 | Pct tubes removed (both) | |
| Effective length (m) | 0,412 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

SI Units

Rating - Horizontal Reflux Condenser - Shellside TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 1,61e-4

Flow fractions for vapor phase

B=0,6690 C=0,3310

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,790 | 0,920 | 0,859 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|-------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 1,84 | 0,65 | Inlet | 97,62 | 44,26 |
| MOMENTUM | | -0,11 | Outlet | 0,00 | 23,05 |

Two-Phase Parameters

| | | | | |
|--------|--------|----------|----------|--------|
| Method | Inlet | Center | Outlet | Mix F |
| REFLUX | Reflux | Sens Liq | Sens Liq | 1,0000 |

H. T. Parameters

Shell

Tube

| | | |
|-------------------------|--------------|-------|
| Overall wall correction | | 1,000 |
| Midpoint | Prandtl no. | 6,03 |
| Midpoint | Reynolds no. | 100 |
| Bundle inlet | Reynolds no. | 98 |
| Bundle outlet | Reynolds no. | 106 |
| Fouling layer | (mm) | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 37,52 | 60,03 | 0,00 | 2,45 | 4356,82 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | 0,0812 |

Shell Nozzles

| | | | | |
|-------------------------|-----------|---------|--------|---------------|
| Inlet at channel end-No | | Inlet | Outlet | Liquid Outlet |
| Number at each position | | 1 | 1 | 1 |
| Diameter | (mm) | 15,799 | 20,930 | 20,930 |
| Velocity | (m/s) | 0,62 | 0,00 | 1,40e-3 |
| Pressure drop | (kPa) | 1,41e-3 | 0,000 | 0,000 |
| Height under nozzle | (mm) | 4,304 | 4,304 | 4,304 |
| Nozzle R-V-SQ | (kg/m-s2) | 1,32 | 0,00 | 1,69e-3 |
| Shell ent. | (kg/m-s2) | 0,88 | 0,00 | |

Tube Nozzle

| | | | | |
|---------------|-----------|---------|---------|---------------|
| | | Inlet | Outlet | Liquid Outlet |
| | | AXIAL | AXIAL | |
| Diameter | (mm) | 15,799 | 15,799 | |
| Velocity | (m/s) | 7,11e-2 | 7,11e-2 | |
| Pressure drop | (kPa) | 2,32e-3 | 1,21e-3 | |
| Nozzle R-V-SQ | (kg/m-s2) | 5,03 | 5,04 | |

Annular Distributor

Inlet

Outlet

| | |
|-----------|-------|
| Length | (mm) |
| Height | (mm) |
| Slot area | (mm2) |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|---|--|---|-------------------|---|------------------------------------|-------------------------|--|
| Service of Unit SKRAPLACZ KOLUMNY 36C-2 | | | | Item No. 36E-4 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | METANOL | | | CW | | |
| Fluid Quantity, Total kg/s | | 4,17e-4 | | | 0,0139 | | |
| Vapor (In/Out) wt% | | 100,00 0,00 | | | 0,00 0,00 | | |
| Liquid wt% | | 0,00 100,00 | | | 100,00 100,00 | | |
| Temperature (In/Out) C | | 140,00 60,00 | | | 25,00 28,77 | | |
| Density kg/m3 | | 3,4121 865,64 | | | 997,14 996,11 | | |
| Viscosity mN-s/m2 | | 0,0096 0,0910 | | | 0,8900 0,8188 | | |
| Specific Heat kJ/kg-C | | 1,7475 2,0091 | | | 4,1813 4,1799 | | |
| Thermal Conductivity W/m-C | | 0,0176 0,1088 | | | 0,6076 0,6133 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 105,00 | | | 300,00 | | |
| Velocity m/s | | 1,29e-4 | | | 1,08e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 1,45e-3 | | | 0,000 5,25e-3 | | |
| Average Film Coefficient W/m2-K | | 1430,7 | | | 1051,0 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 2,19e-4 MegaWatts | | MTD (Corrected) 59,0 C | | Overdesign 4356,82 % | | | |
| Transfer Rate, Service 12,04 W/m2-K | | Calculated 536,78 W/m2-K | | Clean 536,78 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| | | Shell Side | | Tube Side | | | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 171,11 | | 54,44 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| In mm | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Out mm | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Liq. Out mm | | 1 @ 20,930 | | 1 @ | | | |
| Tube No. 25,000 | | OD 9,525 mm | Thk(Avg) 0,711 mm | Length 0,450 m | Pitch 11,906 mm | Tube pattern 30 | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | | | Pairs seal strips 0 | |
| Shell ID 80,000 mm | | Kettle ID mm | | | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | | | Impingement Plate None | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | | | No. of Crosspasses 1 | |
| Rho-V2-Inlet Nozzle 1,32 kg/m-s2 | | Shell Entrance 0,88 kg/m-s2 | | Shell Exit 0,00 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 37,52 | | Shellside 1,29e-4 | | A | |
| | | Tube 60,03 | | Tubeside 1,08e-2 | | B 0,669 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,331 | |
| | | Metal 2,45 | | Window 1,61e-4 | | E | |
| | | | | | | F | |

SI Units

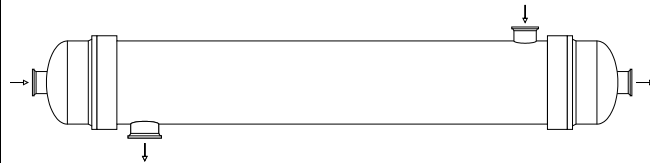
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | METANOL | | CW | |
| Fluid condition | | Sens. Liquid | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 4,17e-4 | | 0,0020 |
| Weight fraction vapor, In/Out | (--) | 0,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 60,00 | 30,00 | 25,00 | 28,00 |
| Skin temperature, Min/Max | (Deg C) | 25,47 | 30,18 | 25,46 | 30,14 |
| Wall temperature, Min/Max | (Deg C) | 25,47 | 30,18 | 25,46 | 30,14 |
| Pressure, In/Average | (kPa) | 102,00 | 102,00 | 300,00 | 300,00 |
| Pressure drop, Total/Allowed | (kPa) | 1,42e-5 | | 3,44e-4 | |
| Velocity, Mid/Max allow | (m/s) | 1,19e-4 | | 1,52e-3 | |
| Mole fraction inert | (--) | | | | |
| Average film coef. | (W/m2-K) | | 28,46 | | 391,99 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|---------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 9,05 | / | 26,19 | / | 26,19 |
| Heat duty, Calculated/Specified | (MegaWatts) | 2,45e-5 | / | | | |
| Effective overall temperature difference | (Deg C) | 8,8 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 14,74 | * | 0,5972 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 411,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length (m) | 0,450 | Pct tubes removed (both) | |
| Effective length (m) | 0,412 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 1,43e-4

Flow fractions for heat transfer 0,722
B=0,6026 C=0,3974

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,582 | 0,920 | 0,633 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 0,00 | 0,00 | Inlet | 60,91 | 13,40 |
| MOMENTUM | | 0,00 | Outlet | 23,18 | 6,98 |

Two-Phase Parameters

| | | | | |
|--------|-------|--------|--------|-------|
| Method | Inlet | Center | Outlet | Mix F |
|--------|-------|--------|--------|-------|

H. T. Parameters

Shell

Tube

| | | | |
|----------------------------|--|-------|-------|
| Overall wall correction | | 1,000 | 1,000 |
| Midpoint Prandtl no. | | 1,63 | 6,01 |
| Midpoint Reynolds no. | | 7 | 14 |
| Bundle inlet Reynolds no. | | 8 | 14 |
| Bundle outlet Reynolds no. | | 17 | 15 |
| Fouling layer (mm) | | | |

Thermal Resistance

| | | | | |
|--------------------------|------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 92,01 | 7,85 | 0,00 | 0,14 | 189,32 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | 0,0723 |

Shell Nozzles

| | | | | |
|--------------------------|--|---------|---------|---------------|
| Inlet at channel end-No | | Inlet | Outlet | Liquid Outlet |
| Number at each position | | 1 | 1 | 1 |
| Diameter (mm) | | 15,799 | 20,930 | 22,454 |
| Velocity (m/s) | | 2,47e-3 | 0,00 | 1,16e-3 |
| Pressure drop (kPa) | | 8,67e-6 | 0,000 | 3,30e-6 |
| Height under nozzle (mm) | | 4,304 | 4,304 | 4,304 |
| Nozzle R-V-SQ (kg/m-s2) | | 5,25e-3 | 1,62e-3 | 1,22e-3 |
| Shell ent. (kg/m-s2) | | 3,48e-3 | 8,09e-4 | |

Tube Nozzle

Inlet

Outlet

Liquid Outlet

| | | | | |
|-------------------------|--|---------|---------|--|
| Diameter (mm) | | AXIAL | AXIAL | |
| Velocity (m/s) | | 15,799 | 15,799 | |
| Pressure drop (kPa) | | 1,00e-2 | 1,00e-2 | |
| Nozzle R-V-SQ (kg/m-s2) | | 4,61e-5 | 2,40e-5 | |
| | | 9,98e-2 | 9,99e-2 | |

Annular Distributor

Inlet

Outlet

| | |
|-----------------|--|
| Length (mm) | |
| Height (mm) | |
| Slot area (mm2) | |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|---|--|---|--|---|--|-------------------------|--|
| Service of Unit CHŁODNICA DESTYLATU Z 36C-2 | | | | Item No. 36E-5 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | Tube Side | | | |
| Fluid Name | | METANOL | | CW | | | |
| Fluid Quantity, Total kg/s | | 4,17e-4 | | 0,0020 | | | |
| Vapor (In/Out) wt% | | 0,00 | | 0,00 | | 0,00 | |
| Liquid wt% | | 100,00 | | 100,00 | | 100,00 | |
| Temperature (In/Out) C | | 60,00 | | 30,00 | | 25,00 | |
| Density kg/m3 | | 860,71 | | 907,59 | | 997,14 | |
| Viscosity mN-s/m2 | | 0,1465 | | 0,0726 | | 0,8900 | |
| Specific Heat kJ/kg-C | | 1,9738 | | 1,9553 | | 4,1813 | |
| Thermal Conductivity W/m-C | | 0,1087 | | 0,1152 | | 0,6076 | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 102,00 | | 300,00 | | | |
| Velocity m/s | | | | 1,19e-4 | | 1,52e-3 | |
| Pressure Drop, Allow/Calc kPa | | 0,000 | | 1,42e-5 | | 0,000 | |
| Average Film Coefficient W/m2-K | | 28,46 | | 391,99 | | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | 0,000000 | | | |
| Heat Exchanged 2,45e-5 MegaWatts | | MTD (Corrected) | | 8,8 C | | Overdesign 189,32 % | |
| Transfer Rate, Service 9,05 W/m2-K | | Calculated | | 26,19 W/m2-K | | Clean 26,19 W/m2-K | |
| CONSTRUCTION OF ONE SHELL | | | | Sketch (Bundle/Nozzle Orientation) | | | |
| Design Pressure kPaG | | Shell Side 517,11 | | Tube Side 517,11 | | | |
| Design Temperature C | | 87,78 | | 60,00 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections In mm | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating Out mm | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Rating Liq. Out mm | | 1 @ 22,454 | | 1 @ | | | |
| Tube No. 25,000 | | OD 9,525 mm | | Thk(Avg) 0,711 mm | | Length 0,450 m | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | Pitch 11,906 mm | | Tube pattern 30 | |
| Shell ID 80,000 mm | | Kettle ID mm | | Pairs seal strips 0 | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | Impingement Plate None | | | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | No. of Crosspasses 1 | | | |
| Rho-V2-Inlet Nozzle 5,25e-3 kg/m-s2 | | Shell Entrance 3,48e-3 kg/m-s2 | | Shell Exit 8,09e-4 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 92,01 | | Shellside 1,19e-4 | | A | |
| | | Tube 7,85 | | Tubeside 1,52e-3 | | B 0,603 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,397 | |
| | | Metal 0,14 | | Window 1,43e-4 | | E | |
| | | | | | | F | |

SI Units

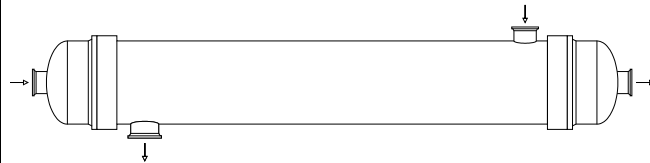
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------|---------------|--|---------------|--------|
| Fluid name | | | MEG | | CW | |
| Fluid condition | | | Cond. Vapor | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0031 | | 0,0440 | |
| Weight fraction vapor, In/Out | (--) | 1,0000 | 0,0000 | | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 160,00 | 40,00 | | 25,00 | 35,00 |
| Skin temperature, Min/Max | (Deg C) | 33,22 | 121,32 | | 32,96 | 117,30 |
| Wall temperature, Min/Max | (Deg C) | 33,22 | 121,32 | | 32,96 | 117,30 |
| Pressure, In/Average | (kPa) | 105,00 | 104,97 | | 300,00 | 299,98 |
| Pressure drop, Total/Allowed | (kPa) | 0,068 | | | 0,041 | |
| Velocity, Mid/Max allow | (m/s) | 1,04e-3 | | | 3,42e-2 | |
| Mole fraction inert | (--) | | 0,0000 | | | |
| Average film coef. | (W/m2-K) | | 1132,4 | | 996,73 | |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 | |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 | |

Overall Performance Data

| | | | | | | |
|--|-------------|--------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 169,84 | / | 474,58 | / | 474,58 |
| Heat duty, Calculated/Specified | (MegaWatts) | 0,0018 | / | | | |
| Effective overall temperature difference | (Deg C) | 35,2 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 77,00 | * | 0,4565 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 411,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length (m) | 0,450 | Pct tubes removed (both) | |
| Effective length (m) | 0,412 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 1,13e-3

Flow fractions for vapor phase
B=0,6515 C=0,3485

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,938 | 0,920 | 1,019 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|-------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 0,61 | 0,10 | Inlet | 99,77 | 56,26 |
| MOMENTUM | | -0,48 | Outlet | 0,00 | 29,36 |

Two-Phase Parameters

| | | | | |
|--------|----------|----------|----------|--------|
| Method | Inlet | Center | Outlet | Mix F |
| RPM | Sens Gas | Sens Liq | Sens Liq | 0,8663 |

H. T. Parameters

Shell

Tube

| | | |
|-------------------------|--------------|-------|
| Overall wall correction | | 1,000 |
| Midpoint | Prandtl no. | 5,91 |
| Midpoint | Reynolds no. | 37 |
| Bundle inlet | Reynolds no. | 937 |
| Bundle outlet | Reynolds no. | 130 |
| Fouling layer | (mm) | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 41,91 | 55,96 | 0,00 | 2,13 | 179,43 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | 0,0038 |

Shell Nozzles

| | | | |
|-------------------------|-----------|--------|---------------|
| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
| Number at each position | 1 | 1 | 1 |
| Diameter | (mm) | 15,799 | 20,930 |
| Velocity | (m/s) | 4,79 | 0,00 |
| Pressure drop | (kPa) | 0,068 | 0,000 |
| Height under nozzle | (mm) | 4,304 | 4,304 |
| Nozzle R-V-SQ | (kg/m-s2) | 74,65 | 0,00 |
| Shell ent. | (kg/m-s2) | 49,47 | 0,00 |

Tube Nozzle

| | | | |
|---------------|-----------|--------|---------------|
| | Inlet | Outlet | Liquid Outlet |
| | AXIAL | AXIAL | |
| Diameter | (mm) | 15,799 | 15,799 |
| Velocity | (m/s) | 0,23 | 0,23 |
| Pressure drop | (kPa) | 0,023 | 0,012 |
| Nozzle R-V-SQ | (kg/m-s2) | 50,49 | 50,64 |

Annular Distributor

Inlet

Outlet

| | |
|-----------|-------|
| Length | (mm) |
| Height | (mm) |
| Slot area | (mm2) |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|--|--|---|--|---|------------------------------------|-------------------------|--|
| Service of Unit CHŁODNICA GLIKOLU | | | | Item No. 36E-6 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | MEG | | | CW | | |
| Fluid Quantity, Total kg/s | | 0,0031 | | | 0,0440 | | |
| Vapor (In/Out) wt% | | 100,00 0,00 | | | 0,00 0,00 | | |
| Liquid wt% | | 0,00 100,00 | | | 100,00 100,00 | | |
| Temperature (In/Out) C | | 160,00 40,00 | | | 25,00 35,00 | | |
| Density kg/m3 | | 3,2545 894,27 | | | 997,14 994,13 | | |
| Viscosity mN-s/m2 | | 0,0100 0,0727 | | | 0,8900 0,7195 | | |
| Specific Heat kJ/kg-C | | 1,8248 1,9778 | | | 4,1813 4,1784 | | |
| Thermal Conductivity W/m-C | | 0,0193 0,1131 | | | 0,6076 0,6221 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 105,00 | | | 300,00 | | |
| Velocity m/s | | 1,04e-3 | | | 3,42e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 0,068 | | | 0,000 0,041 | | |
| Average Film Coefficient W/m2-K | | 1132,4 | | | 996,73 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 0,0018 MegaWatts | | MTD (Corrected) 35,2 C | | Overdesign 179,43 % | | | |
| Transfer Rate, Service 169,84 W/m2-K | | Calculated 474,58 W/m2-K | | Clean 474,58 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| | | Shell Side | | Tube Side | | | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 187,78 | | 65,56 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 25,000 | | OD 9,525 mm | | Thk(Avg) 0,711 mm | | Length 0,450 m | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | Pitch 11,906 mm | | Tube pattern 30 | |
| Shell ID 80,000 mm | | Kettle ID mm | | Pairs seal strips 0 | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | Impingement Plate None | | | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | No. of Crosspasses 1 | | | |
| Rho-V2-Inlet Nozzle 74,65 kg/m-s2 | | Shell Entrance 49,47 kg/m-s2 | | Shell Exit 0,00 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 41,91 | | Shellside 1,04e-3 | | A | |
| | | Tube 55,96 | | Tubeside 3,42e-2 | | B 0,652 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,348 | |
| | | Metal 2,13 | | Window 1,13e-3 | | E | |
| | | | | | | F | |

SI Units

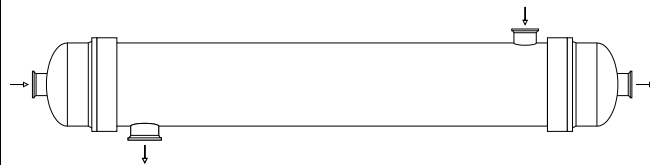
Rating - Horizontal Reflux Condenser - Shellside TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | METANOL | | CW | |
| Fluid condition | | Cond. Vapor | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0072 | | 0,0139 |
| Weight fraction vapor, In/Out | (--) | 1,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 140,00 | 60,00 | 25,00 | 90,25 |
| Skin temperature, Min/Max | (Deg C) | 44,85 | 120,45 | 44,20 | 118,83 |
| Wall temperature, Min/Max | (Deg C) | 44,85 | 120,45 | 44,20 | 118,83 |
| Pressure, In/Average | (kPa) | 105,00 | 104,83 | 300,00 | 300,00 |
| Pressure drop, Total/Allowed | (kPa) | 0,349 | | 4,84e-3 | |
| Velocity, Mid/Max allow | (m/s) | 2,02e-2 | | 1,09e-2 | |
| Mole fraction inert | (--) | | 0,0000 | | |
| Average film coef. | (W/m2-K) | | 1337,0 | | 1193,5 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|--------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 291,62 | / | 562,30 | / | 562,30 |
| Heat duty, Calculated/Specified | (MegaWatts) | 0,0038 | / | | | |
| Effective overall temperature difference | (Deg C) | 42,2 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 66,31 | * | 0,6369 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 411,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length (m) | 0,450 | Pct tubes removed (both) | |
| Effective length (m) | 0,412 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Reflux Condenser - Shellside TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 2,15e-2

Flow fractions for vapor phase
B=0,6078 C=0,3922

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,938 | 0,920 | 1,019 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|-------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 1,12 | 0,26 | Inlet | 98,77 | 48,02 |
| MOMENTUM | | -0,15 | Outlet | 0,00 | 25,81 |

Two-Phase Parameters

| | | | | |
|--------|--------|--------|----------|--------|
| Method | Inlet | Center | Outlet | Mix F |
| REFLUX | Reflux | Reflux | Sens Liq | 0,9715 |

H. T. Parameters

Shell

Tube

| | | |
|----------------------------|--|-------|
| Overall wall correction | | 1,000 |
| Midpoint Prandtl no. | | 3,88 |
| Midpoint Reynolds no. | | 148 |
| Bundle inlet Reynolds no. | | 99 |
| Bundle outlet Reynolds no. | | 274 |
| Fouling layer (mm) | | |

Thermal Resistance

| | | | | |
|-------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 42,05 | 55,38 | 0,00 | 2,57 | 92,82 |

Total fouling resistance

0,0000

Differential resistance

0,0016

Shell Nozzles

| | | | |
|--------------------------|--------|--------|---------------|
| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
| Number at each position | 1 | 1 | 1 |
| Diameter (mm) | 15,799 | 20,930 | 20,930 |
| Velocity (m/s) | 10,80 | 0,00 | 2,43e-2 |
| Pressure drop (kPa) | 0,345 | 0,000 | 0,000 |
| Height under nozzle (mm) | 4,304 | 4,304 | 4,304 |
| Nozzle R-V-SQ (kg/m-s2) | 397,78 | 0,00 | 0,51 |
| Shell ent. (kg/m-s2) | 263,61 | 0,00 | |

Tube Nozzle

| | | | |
|-------------------------|---------|---------|---------------|
| | Inlet | Outlet | Liquid Outlet |
| | AXIAL | AXIAL | |
| Diameter (mm) | 15,799 | 15,799 | |
| Velocity (m/s) | 7,11e-2 | 7,34e-2 | |
| Pressure drop (kPa) | 2,32e-3 | 1,25e-3 | |
| Nozzle R-V-SQ (kg/m-s2) | 5,03 | 5,20 | |

Annular Distributor

Inlet

Outlet

| | |
|-----------------|--|
| Length (mm) | |
| Height (mm) | |
| Slot area (mm2) | |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|---|--|---|-------------------|---|------------------------------------|-------------------------|--|
| Service of Unit SKRAPLACZ KOLUMNY 36C-3 | | | | Item No. 36E-7 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | METANOL | | | CW | | |
| Fluid Quantity, Total kg/s | | 0,0072 | | | 0,0139 | | |
| Vapor (In/Out) wt% | | 100,00 0,00 | | | 0,00 0,00 | | |
| Liquid wt% | | 0,00 100,00 | | | 100,00 100,00 | | |
| Temperature (In/Out) C | | 140,00 60,00 | | | 25,00 90,25 | | |
| Density kg/m3 | | 3,4121 865,63 | | | 997,14 965,24 | | |
| Viscosity mN-s/m2 | | 0,0096 0,0911 | | | 0,8900 0,3136 | | |
| Specific Heat kJ/kg-C | | 1,7475 2,0091 | | | 4,1813 4,2048 | | |
| Thermal Conductivity W/m-C | | 0,0176 0,1088 | | | 0,6076 0,6733 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 105,00 | | | 300,00 | | |
| Velocity m/s | | 2,02e-2 | | | 1,09e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 0,349 | | | 0,000 4,84e-3 | | |
| Average Film Coefficient W/m2-K | | 1337,0 | | | 1193,5 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 0,0038 MegaWatts | | MTD (Corrected) 42,2 C | | Overdesign 92,82 % | | | |
| Transfer Rate, Service 291,62 W/m2-K | | Calculated 562,30 W/m2-K | | Clean 562,30 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| | | Shell Side | | Tube Side | | | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 171,11 | | 54,44 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| In mm | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Out mm | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Liq. Out mm | | 1 @ 20,930 | | 1 @ | | | |
| Tube No. 25,000 | | OD 9,525 mm | Thk(Avg) 0,711 mm | Length 0,450 m | Pitch 11,906 mm | Tube pattern 30 | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | | | Pairs seal strips 0 | |
| Shell ID 80,000 mm | | Kettle ID mm | | | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | | | Impingement Plate None | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | | | No. of Crosspasses 1 | |
| Rho-V2-Inlet Nozzle 397,78 kg/m-s2 | | Shell Entrance 263,61 kg/m-s2 | | Shell Exit 0,00 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 42,05 | | Shellside 2,02e-2 | | A | |
| | | Tube 55,38 | | Tubeside 1,09e-2 | | B 0,608 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,392 | |
| | | Metal 2,57 | | Window 2,15e-2 | | E | |
| | | | | | | F | |

SI Units

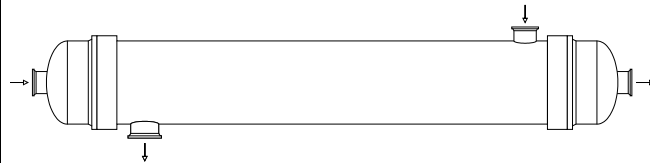
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | METANOL | | CW | |
| Fluid condition | | Sens. Liquid | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0072 | | 0,0139 |
| Weight fraction vapor, In/Out | (--) | 0,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 60,00 | 30,00 | 25,00 | 32,32 |
| Skin temperature, Min/Max | (Deg C) | 25,97 | 36,37 | 25,95 | 36,27 |
| Wall temperature, Min/Max | (Deg C) | 25,97 | 36,37 | 25,95 | 36,27 |
| Pressure, In/Average | (kPa) | 102,00 | 102,00 | 300,00 | 300,00 |
| Pressure drop, Total/Allowed | (kPa) | 2,26e-3 | | 5,44e-3 | |
| Velocity, Mid/Max allow | (m/s) | 2,30e-3 | | 1,08e-2 | |
| Mole fraction inert | (--) | | | | |
| Average film coef. | (W/m2-K) | | 89,50 | | 484,28 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | |
|--|-------------|-----------|----------|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 148,67 / | 73,26 / | 73,26 |
| Heat duty, Calculated/Specified | (MegaWatts) | 4,26e-4 / | | |
| Effective overall temperature difference | (Deg C) | 9,3 | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 13,31 * | 0,6978 * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|-----------------|--------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 / | 104,55 / | 3,02 (kg/shell) | |

Baffle Information

| | | | |
|--------------------------|-------------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing | (mm) 411,90 | 1 | |
| Inlet spacing | (mm) 0,000 | 2 | |
| Outlet spacing | (mm) 0,000 | | |
| Baffle thickness | (mm) 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|------------------|------------------------------------|--------------------------|---------------------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length | (m) 0,450 | Pct tubes removed (both) | |
| Effective length | (m) 0,412 | Outside diameter | (mm) 9,525 |
| Total tubesheet | (mm) 38,100 | Wall thickness | (mm) 0,711 |
| Area ratio | (out/in) 1,1755 | Pitch (mm) | 11,906 Ratio 1,2500 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Tube pattern (deg) | 30 |

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 2,49e-3

Flow fractions for heat transfer 0,769
B=0,6695 C=0,3305

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,816 | 0,920 | 0,886 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 2,50 | 0,29 | Inlet | 73,25 | 42,72 |
| MOMENTUM | | 0,00 | Outlet | 23,95 | 22,28 |

Two-Phase Parameters

| | | | | |
|--------|-------|--------|--------|-------|
| Method | Inlet | Center | Outlet | Mix F |
|--------|-------|--------|--------|-------|

H. T. Parameters

Shell

Tube

| | | | |
|----------------------------|--|-------|-------|
| Overall wall correction | | 1,000 | 1,000 |
| Midpoint Prandtl no. | | 1,66 | 5,82 |
| Midpoint Reynolds no. | | 126 | 103 |
| Bundle inlet Reynolds no. | | 154 | 98 |
| Bundle outlet Reynolds no. | | 310 | 114 |
| Fouling layer (mm) | | | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 81,85 | 17,78 | 0,00 | 0,37 | -50,72 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | -0,007 |

Shell Nozzles

| | | | | |
|--------------------------|--|---------|--------|---------------|
| Inlet at channel end-No | | Inlet | Outlet | Liquid Outlet |
| Number at each position | | 1 | 1 | 1 |
| Diameter (mm) | | 15,799 | 20,930 | 22,454 |
| Velocity (m/s) | | 4,28e-2 | 0,00 | 2,01e-2 |
| Pressure drop (kPa) | | 1,66e-3 | 0,000 | 5,42e-4 |
| Height under nozzle (mm) | | 4,304 | 4,304 | 4,304 |
| Nozzle R-V-SQ (kg/m-s2) | | 1,58 | 0,49 | 0,37 |
| Shell ent. (kg/m-s2) | | 1,05 | 0,24 | |

Tube Nozzle

| | | | | |
|-------------------------|--|---------|---------|---------------|
| | | Inlet | Outlet | Liquid Outlet |
| | | AXIAL | AXIAL | |
| Diameter (mm) | | 15,799 | 15,799 | |
| Velocity (m/s) | | 7,11e-2 | 7,12e-2 | |
| Pressure drop (kPa) | | 2,32e-3 | 1,21e-3 | |
| Nozzle R-V-SQ (kg/m-s2) | | 5,03 | 5,04 | |

Annular Distributor

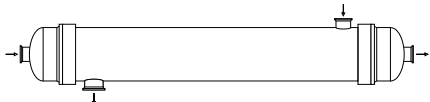
| | | | |
|-----------------|--|-------|--------|
| | | Inlet | Outlet |
| Length (mm) | | | |
| Height (mm) | | | |
| Slot area (mm2) | | | |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|---|--|---|--|---|------------------------------------|---|--|
| Service of Unit CHŁODNICA DESTYLATU Z 36C-3 | | | | Item No. 36E-8 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | METANOL | | | CW | | |
| Fluid Quantity, Total kg/s | | 0,0072 | | | 0,0139 | | |
| Vapor (In/Out) wt% | | 0,00 | | | 0,00 | | |
| Liquid wt% | | 100,00 | | | 100,00 | | |
| Temperature (In/Out) C | | 60,00 | | | 25,00 | | |
| Density kg/m3 | | 860,71 | | | 997,14 | | |
| Viscosity mN-s/m2 | | 0,1465 | | | 0,8900 | | |
| Specific Heat kJ/kg-C | | 1,9738 | | | 4,1813 | | |
| Thermal Conductivity W/m-C | | 0,1087 | | | 0,6076 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 102,00 | | | 300,00 | | |
| Velocity m/s | | 2,30e-3 | | | 1,08e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 | | | 0,000 | | |
| Average Film Coefficient W/m2-K | | 89,50 | | | 484,28 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 4,26e-4 MegaWatts | | MTD (Corrected) 9,3 C | | Overdesign -50,72 % | | | |
| Transfer Rate, Service 148,67 W/m2-K | | Calculated 73,26 W/m2-K | | Clean 73,26 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| | | Shell Side | | Tube Side | |  | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 87,78 | | 54,44 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 25,000 | | OD 9,525 mm | | Thk(Avg) 0,711 mm | | Length 0,450 m | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | Pitch 11,906 mm | | Tube pattern 30 | |
| Shell ID 80,000 mm | | Kettle ID mm | | Pairs seal strips 0 | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | Impingement Plate None | | | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | No. of Crosspasses 1 | | | |
| Rho-V2-Inlet Nozzle 1,58 kg/m-s2 | | Shell Entrance 1,05 kg/m-s2 | | Shell Exit 0,24 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 81,85 | | Shellside 2,30e-3 | | A | |
| | | Tube 17,78 | | Tubeside 1,08e-2 | | B 0,669 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,331 | |
| | | Metal 0,37 | | Window 2,49e-3 | | E | |
| | | | | | | F | |

SI Units

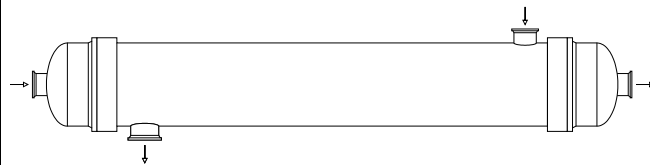
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | MEOH + DMC | | CW | |
| Fluid condition | | Sens. Liquid | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0139 | | 0,0723 |
| Weight fraction vapor, In/Out | (--) | 0,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 90,00 | 35,00 | 25,00 | 30,00 |
| Skin temperature, Min/Max | (Deg C) | 26,56 | 39,75 | 26,51 | 39,48 |
| Wall temperature, Min/Max | (Deg C) | 26,56 | 39,75 | 26,51 | 39,48 |
| Pressure, In/Average | (kPa) | 102,00 | 102,00 | 300,00 | 299,95 |
| Pressure drop, Total/Allowed | (kPa) | 8,33e-3 | | 0,108 | |
| Velocity, Mid/Max allow | (m/s) | 4,52e-3 | | 5,63e-2 | |
| Mole fraction inert | (--) | | | | |
| Average film coef. | (W/m2-K) | | 117,76 | | 643,42 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|--------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 238,30 | / | 96,46 | / | 96,46 |
| Heat duty, Calculated/Specified | (MegaWatts) | 0,0015 | / | | | |
| Effective overall temperature difference | (Deg C) | 20,6 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 28,07 | * | 0,7339 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 411,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length (m) | 0,450 | Pct tubes removed (both) | |
| Effective length (m) | 0,412 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 4,89e-3

Flow fractions for heat transfer 0,768
B=0,6691 C=0,3309

Shellside Heat Transfer Corrections

| Total | Beta | Gamma | End | Fin |
|-------|-------|-------|-------|-------|
| 0,847 | 0,920 | 0,921 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| Cross | Window | Ends | Nozzle | Shell | Tube |
|----------|--------|------|--------|-------|-------|
| 0,00 | 1,99 | 0,23 | Inlet | 75,11 | 58,61 |
| MOMENTUM | | 0,00 | Outlet | 22,67 | 30,53 |

Two-Phase Parameters

| Method | Inlet | Center | Outlet | Mix F |
|--------|-------|--------|--------|-------|
|--------|-------|--------|--------|-------|

H. T. Parameters

Shell

Tube

| | | | |
|----------------------------|--|-------|-------|
| Overall wall correction | | 1,000 | 1,000 |
| Midpoint Prandtl no. | | 2,32 | 5,92 |
| Midpoint Reynolds no. | | 179 | 527 |
| Bundle inlet Reynolds no. | | 211 | 511 |
| Bundle outlet Reynolds no. | | 513 | 567 |
| Fouling layer (mm) | | | |

Thermal Resistance

| Shell | Tube | Fouling | Metal | Over Des |
|--------------------------|-------|---------|-------|----------|
| 81,91 | 17,62 | 0,00 | 0,47 | -59,52 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | -0,006 |

Shell Nozzles

| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
|--------------------------|---------|--------|---------------|
| Number at each position | 1 | 1 | 1 |
| Diameter (mm) | 15,799 | 20,930 | 22,454 |
| Velocity (m/s) | 8,67e-2 | 0,00 | 3,90e-2 |
| Pressure drop (kPa) | 6,26e-3 | 0,000 | 1,89e-3 |
| Height under nozzle (mm) | 4,304 | 4,304 | 4,304 |
| Nozzle R-V-SQ (kg/m-s2) | 6,14 | 1,81 | 1,37 |
| Shell ent. (kg/m-s2) | 4,07 | 0,91 | |

Tube Nozzle

| | Inlet | Outlet | Liquid Outlet |
|-------------------------|--------|--------|---------------|
| | AXIAL | AXIAL | |
| Diameter (mm) | 15,799 | 15,799 | |
| Velocity (m/s) | 0,37 | 0,37 | |
| Pressure drop (kPa) | 0,063 | 0,033 | |
| Nozzle R-V-SQ (kg/m-s2) | 136,58 | 136,77 | |

Annular Distributor

Inlet

Outlet

| | |
|-----------------|--|
| Length (mm) | |
| Height (mm) | |
| Slot area (mm2) | |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|---------------------------------------|--|---|--|--------------------------|------------------------------------|---|--|
| Service of Unit CHŁODNICA DMC Z 36C-3 | | | | Item No. 36E-9 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 | | m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | MEOH + DMC | | | CW | | |
| Fluid Quantity, Total kg/s | | 0,0139 | | | 0,0723 | | |
| Vapor (In/Out) wt% | | 0,00 | | | 0,00 | | |
| Liquid wt% | | 100,00 | | | 100,00 | | |
| Temperature (In/Out) C | | 90,00 | | | 25,00 | | |
| Density kg/m3 | | 817,15 | | | 997,14 | | |
| Viscosity mN-s/m2 | | 0,2046 | | | 0,8900 | | |
| Specific Heat kJ/kg-C | | 2,0148 | | | 4,1813 | | |
| Thermal Conductivity W/m-C | | 0,1022 | | | 0,6076 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 102,00 | | | 300,00 | | |
| Velocity m/s | | 4,52e-3 | | | 5,63e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 | | | 0,000 | | |
| Average Film Coefficient W/m2-K | | 117,76 | | | 643,42 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 0,0015 MegaWatts | | MTD (Corrected) 20,6 C | | Overdesign -59,52 % | | | |
| Transfer Rate, Service 238,30 W/m2-K | | Calculated 96,46 W/m2-K | | Clean 96,46 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| Design Pressure kPaG | | Shell Side 517,11 | | Tube Side 517,11 | | | |
| Design Temperature C | | 121,11 | | 60,00 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 25,000 | | OD 9,525 mm | | Thk(Avg) 0,711 mm | | Length 0,450 m | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | Pitch 11,906 mm | | Tube pattern 30 | |
| Shell ID 80,000 mm | | Kettle ID mm | | Pairs seal strips 0 | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | Impingement Plate None | | | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | No. of Crosspasses 1 | | | |
| Rho-V2-Inlet Nozzle 6,14 kg/m-s2 | | Shell Entrance 4,07 kg/m-s2 | | Shell Exit 0,91 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 81,91 | | Shellside 4,52e-3 | | A | |
| | | Tube 17,62 | | Tubeside 5,63e-2 | | B 0,669 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,331 | |
| | | Metal 0,47 | | Window 4,89e-3 | | E | |
| | | | | | | F | |

SI Units

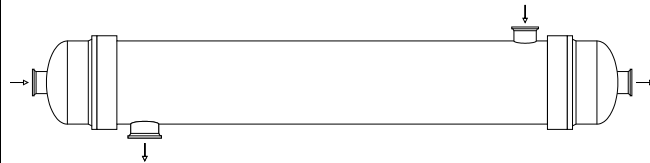
Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

| Process Data | | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|--------|---------------|--|---------------|--------|
| Fluid name | | | MEG | | CW | |
| Fluid condition | | | Cond. Vapor | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0039 | | 0,0332 | |
| Weight fraction vapor, In/Out | (--) | 1,0000 | 0,0000 | | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 190,00 | 100,00 | | 25,00 | 40,00 |
| Skin temperature, Min/Max | (Deg C) | 62,45 | 123,16 | | 61,05 | 119,21 |
| Wall temperature, Min/Max | (Deg C) | 62,45 | 123,16 | | 61,05 | 119,21 |
| Pressure, In/Average | (kPa) | 105,00 | 104,94 | | 300,00 | 299,99 |
| Pressure drop, Total/Allowed | (kPa) | 0,118 | | | 0,024 | |
| Velocity, Mid/Max allow | (m/s) | 0,13 | | | 2,59e-2 | |
| Mole fraction inert | (--) | | 0,0000 | | | |
| Average film coef. | (W/m2-K) | | 1566,2 | | 1191,0 | |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 | |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 | |

Overall Performance Data

| | | | | | | |
|--|-------------|--------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 71,06 | / | 599,18 | / | 599,18 |
| Heat duty, Calculated/Specified | (MegaWatts) | 0,0021 | / | | | |
| Effective overall temperature difference | (Deg C) | 95,2 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 107,49 | * | 0,8856 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 108,41 | / | 105,79 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|--------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing (mm) | 411,90 | 1 | |
| Inlet spacing (mm) | 0,000 | 2 | |
| Outlet spacing (mm) | 0,000 | | |
| Baffle thickness (mm) | 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|----------------------|------------------------------------|--------------------------|--------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length (m) | 0,450 | Pct tubes removed (both) | |
| Effective length (m) | 0,412 | Outside diameter (mm) | 9,525 |
| Total tubesheet (mm) | 38,100 | Wall thickness (mm) | 0,711 |
| Area ratio (out/in) | 1,1755 | Pitch (mm) | 11,906 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Ratio | 1,2500 |
| | | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Countercurrent Flow TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 0,14

Flow fractions for vapor phase

B=0,6415 C=0,3585

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,938 | 0,920 | 1,019 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|-------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 1,11 | 0,10 | Inlet | 99,41 | 54,79 |
| MOMENTUM | | -0,62 | Outlet | 0,00 | 28,65 |

Two-Phase Parameters

| | | | | |
|--------|----------|---------|----------|--------|
| Method | Inlet | Center | Outlet | Mix F |
| RPM | Sens Gas | Gravity | Sens Liq | 0,9356 |

H. T. Parameters

Shell

Tube

| | | |
|-------------------------|--------------|-------|
| Overall wall correction | | 1,000 |
| Midpoint | Prandtl no. | 5,27 |
| Midpoint | Reynolds no. | 44 |
| Bundle inlet | Reynolds no. | 1110 |
| Bundle outlet | Reynolds no. | 85 |
| Fouling layer | (mm) | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 38,25 | 59,13 | 0,00 | 2,61 | 743,17 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | 0,0124 |

Shell Nozzles

| | | | |
|-------------------------|-----------|--------|---------------|
| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
| Number at each position | 1 | 1 | 1 |
| Diameter | (mm) | 15,799 | 20,930 |
| Velocity | (m/s) | 6,59 | 0,00 |
| Pressure drop | (kPa) | 0,117 | 0,000 |
| Height under nozzle | (mm) | 4,304 | 4,304 |
| Nozzle R-V-SQ | (kg/m-s2) | 130,66 | 0,00 |
| Shell ent. | (kg/m-s2) | 86,59 | 0,00 |

Tube Nozzle

| | | | |
|---------------|-----------|--------|---------------|
| | Inlet | Outlet | Liquid Outlet |
| | AXIAL | AXIAL | |
| Diameter | (mm) | 15,799 | 15,799 |
| Velocity | (m/s) | 0,17 | 0,17 |
| Pressure drop | (kPa) | 0,013 | 6,96e-3 |
| Nozzle R-V-SQ | (kg/m-s2) | 28,81 | 28,95 |

Annular Distributor

Inlet

Outlet

| | |
|-----------|-------|
| Length | (mm) |
| Height | (mm) |
| Slot area | (mm2) |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|--|--|---|-------------------|---|------------------------------------|-------------------------|--|
| Service of Unit CHŁODNICA GLIKOLU | | | | Item No. 36E-10 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | MEG | | | CW | | |
| Fluid Quantity, Total kg/s | | 0,0039 | | | 0,0332 | | |
| Vapor (In/Out) wt% | | 100,00 0,00 | | | 0,00 0,00 | | |
| Liquid wt% | | 0,00 100,00 | | | 100,00 100,00 | | |
| Temperature (In/Out) C | | 190,00 100,00 | | | 25,00 40,00 | | |
| Density kg/m3 | | 3,0118 808,37 | | | 997,14 992,31 | | |
| Viscosity mN-s/m2 | | 0,0106 0,1427 | | | 0,8900 0,6532 | | |
| Specific Heat kJ/kg-C | | 1,9452 2,0717 | | | 4,1813 4,1781 | | |
| Thermal Conductivity W/m-C | | 0,0219 0,1001 | | | 0,6076 0,6287 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 105,00 | | | 300,00 | | |
| Velocity m/s | | 0,13 | | | 2,59e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 0,118 | | | 0,000 0,024 | | |
| Average Film Coefficient W/m2-K | | 1566,2 | | | 1191,0 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 0,0021 MegaWatts | | MTD (Corrected) 95,2 C | | Overdesign 743,17 % | | | |
| Transfer Rate, Service 71,06 W/m2-K | | Calculated 599,18 W/m2-K | | Clean 599,18 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| | | Shell Side | | Tube Side | | | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 221,11 | | 71,11 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 25,000 | | OD 9,525 mm | Thk(Avg) 0,711 mm | Length 0,450 m | Pitch 11,906 mm | Tube pattern 30 | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | | | Pairs seal strips 0 | |
| Shell ID 80,000 mm | | Kettle ID mm | | | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | | | Impingement Plate None | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | | | No. of Crosspasses 1 | |
| Rho-V2-Inlet Nozzle 130,66 kg/m-s2 | | Shell Entrance 86,59 kg/m-s2 | | Shell Exit 0,00 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 105,79 kg | | Filled with Water 108,41 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 38,25 | | Shellside 0,13 | | A | |
| | | Tube 59,13 | | Tubeside 2,59e-2 | | B 0,641 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,359 | |
| | | Metal 2,61 | | Window 0,14 | | E | |
| | | | | | | F | |

SI Units

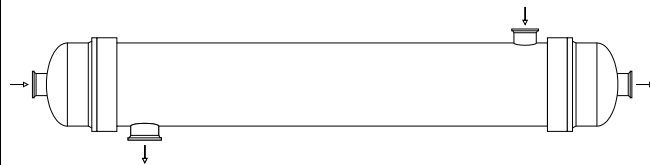
Rating - Horizontal Reflux Condenser - Shellside TEMA BEM Shell With No Baffles

| Process Data | | Hot Shellside | | Cold Tubeside | |
|-------------------------------|----------|---------------|----------|---------------|----------|
| Fluid name | | PERMEAT | | CW | |
| Fluid condition | | Cond. Vapor | | Sens. Liquid | |
| Total flow rate | (kg/s) | | 0,0014 | | 0,0139 |
| Weight fraction vapor, In/Out | (--) | 1,0000 | 0,0000 | 0,0000 | 0,0000 |
| Temperature, In/Out | (Deg C) | 62,00 | 43,89 | 7,00 | 17,78 |
| Skin temperature, Min/Max | (Deg C) | 18,57 | 42,42 | 18,55 | 41,39 |
| Wall temperature, Min/Max | (Deg C) | 18,57 | 42,42 | 18,55 | 41,39 |
| Pressure, In/Average | (kPa) | 4,000 | 3,843 | 300,00 | 300,00 |
| Pressure drop, Total/Allowed | (kPa) | 0,315 | | 5,80e-3 | |
| Velocity, Mid/Max allow | (m/s) | 1,88 | | 1,08e-2 | |
| Mole fraction inert | (--) | | 0,0000 | | |
| Average film coef. | (W/m2-K) | | 1056,3 | | 650,58 |
| Heat transfer safety factor | (--) | | 1,0000 | | 1,0000 |
| Fouling resistance | (m2-K/W) | | 0,000000 | | 0,000000 |

Overall Performance Data

| | | | | | | |
|--|-------------|---------|---|--------|---|--------|
| Overall coef., Req'd/Clean/Actual | (W/m2-K) | 64,63 | / | 356,75 | / | 356,75 |
| Heat duty, Calculated/Specified | (MegaWatts) | 6,28e-4 | / | | | |
| Effective overall temperature difference | (Deg C) | 31,5 | | | | |
| EMTD = (MTD) * (DELTA) * (F/G/H) | (Deg C) | 31,74 | * | 0,9933 | * | 1,0000 |

See Runtime Messages Report for warnings.



Exchanger Fluid Volumes

| | |
|---------------------------|-----|
| Approximate shellside (L) | 1,3 |
| Approximate tubeside (L) | 1,3 |

Shell Construction Information

| | | | | |
|----------------------------------|------------|-------------------------|------------|-------------------|
| TEMA shell type | BEM | Shell ID | (mm) | 80,000 |
| Shells Series | 1 Parallel | Total area | (m2) | 0,337 |
| Passes Shell | 1 Tube | Eff. area | (m2/shell) | 0,308 |
| Shell orientation angle (deg) | 0,00 | | | |
| Impingement present | No | | | |
| Pairs seal strips | 0 | Passlane seal rods (mm) | 0,000 | No. 0 |
| Shell expansion joint | No | Rear head support plate | No | |
| Weight estimation Wet/Dry/Bundle | 107,17 | / | 104,55 | / 3,02 (kg/shell) |

Baffle Information

| | | | |
|--------------------------|-------------|--------------------|-------------|
| Type | None | Baffle cut (% dia) | |
| Crosspasses/shellpass | 1 | No. (Pct Area) | (mm) to C.L |
| Central spacing | (mm) 411,90 | 1 | |
| Inlet spacing | (mm) 0,000 | 2 | |
| Outlet spacing | (mm) 0,000 | | |
| Baffle thickness | (mm) 0,000 | | |
| Use deresonating baffles | No | | |

Tube Information

| | | | |
|------------------|------------------------------------|--------------------------|---------------------|
| Tube type | Plain | Tubecount per shell | 25 |
| Overall length | (m) 0,450 | Pct tubes removed (both) | |
| Effective length | (m) 0,412 | Outside diameter | (mm) 9,525 |
| Total tubesheet | (mm) 38,100 | Wall thickness | (mm) 0,711 |
| Area ratio | (out/in) 1,1755 | Pitch (mm) | 11,906 Ratio 1,2500 |
| Tube metal | 316 Stainless steel (17 Cr, 12 Ni) | Tube pattern (deg) | 30 |

Final Results

Page 2

SI Units

Rating - Horizontal Reflux Condenser - Shellside TEMA BEM Shell With No Baffles

Shellside Performance

Nom vel, X-flow/window 0,00 / 2,09

Flow fractions for vapor phase
B=0,6582 C=0,3418

Shellside Heat Transfer Corrections

| | | | | |
|-------|-------|-------|-------|-------|
| Total | Beta | Gamma | End | Fin |
| 0,920 | 0,920 | 1,000 | 1,000 | 1,000 |

Pressure Drops (Percent of Total)

| | | | | | |
|----------|--------|-------|--------|-------|-------|
| Cross | Window | Ends | Nozzle | Shell | Tube |
| 0,00 | 2,16 | 0,14 | Inlet | 97,82 | 39,98 |
| MOMENTUM | | -0,12 | Outlet | 0,00 | 20,83 |

Two-Phase Parameters

| | | | | |
|--------|----------|--------|--------|--------|
| Method | Inlet | Center | Outlet | Mix F |
| REFLUX | Sens Gas | Reflux | Reflux | 0,8670 |

H. T. Parameters

Shell

Tube

| | | |
|-------------------------|--------------|-------|
| Overall wall correction | | 1,000 |
| Midpoint | Prandtl no. | 8,21 |
| Midpoint | Reynolds no. | 76 |
| Bundle inlet | Reynolds no. | 62 |
| Bundle outlet | Reynolds no. | 82 |
| Fouling layer | (mm) | |

Thermal Resistance

| | | | | |
|--------------------------|-------|---------|-------|----------|
| Shell | Tube | Fouling | Metal | Over Des |
| 33,77 | 64,45 | 0,00 | 1,77 | 452,01 |
| Total fouling resistance | | | | 0,0000 |
| Differential resistance | | | | 0,0127 |

Shell Nozzles

| | | | |
|-------------------------|-----------|--------|---------------|
| Inlet at channel end-No | Inlet | Outlet | Liquid Outlet |
| Number at each position | 1 | 1 | 1 |
| Diameter | (mm) | 15,799 | 20,930 |
| Velocity | (m/s) | 46,23 | 0,00 |
| Pressure drop | (kPa) | 0,308 | 0,000 |
| Height under nozzle | (mm) | 4,304 | 4,304 |
| Nozzle R-V-SQ | (kg/m-s2) | 327,52 | 0,00 |
| Shell ent. | (kg/m-s2) | 217,05 | 0,00 |

Tube Nozzle

| | | | |
|---------------|-----------|---------|---------------|
| | Inlet | Outlet | Liquid Outlet |
| | AXIAL | AXIAL | |
| Diameter | (mm) | 15,799 | 15,799 |
| Velocity | (m/s) | 7,08e-2 | 7,09e-2 |
| Pressure drop | (kPa) | 2,32e-3 | 1,21e-3 |
| Nozzle R-V-SQ | (kg/m-s2) | 5,02 | 5,03 |

Annular Distributor

Inlet

Outlet

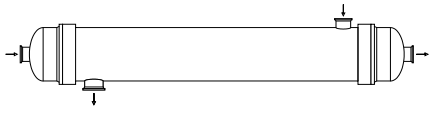
| | |
|-----------|-------|
| Length | (mm) |
| Height | (mm) |
| Slot area | (mm2) |

Diametral Clearances (mm)

| | | |
|-----------------|-----------------|----------------|
| Baffle-to-shell | Bundle-to-shell | Tube-to-baffle |
| 3,1750 | 7,4731 | 0,0000 |

HEAT EXCHANGER RATING DATA SHEET

Page 3
SI Units

| | | | | | | | |
|--|--|---|-------------------|---|------------------------------------|---|--|
| Service of Unit SKRAPLACZ PERMEATU | | | | Item No. 36E-12 | | | |
| Type BEM | | Orientation Horizontal | | Connected In 1 Parallel | | 1 Series | |
| Surf/Unit (Gross/Eff) 0,337 / 0,308 m2 | | Shell/Unit 1 | | Surf/Shell (Gross/Eff) 0,337 / 0,308 m2 | | | |
| PERFORMANCE OF ONE UNIT | | | | | | | |
| Fluid Allocation | | Shell Side | | | Tube Side | | |
| Fluid Name | | PERMEAT | | | CW | | |
| Fluid Quantity, Total kg/s | | 0,0014 | | | 0,0139 | | |
| Vapor (In/Out) wt% | | 100,00 0,00 | | | 0,00 0,00 | | |
| Liquid wt% | | 0,00 100,00 | | | 100,00 100,00 | | |
| Temperature (In/Out) C | | 62,00 43,89 | | | 7,00 17,78 | | |
| Density kg/m3 | | 0,1533 885,46 | | | 1000,0 998,73 | | |
| Viscosity mN-s/m2 | | 0,0078 0,1064 | | | 1,4267 1,0585 | | |
| Specific Heat kJ/kg-C | | 1,4525 1,9610 | | | 4,1999 4,1859 | | |
| Thermal Conductivity W/m-C | | 0,0111 0,1122 | | | 0,5764 0,5959 | | |
| Critical Pressure kPa | | | | | | | |
| Inlet Pressure kPa | | 4,000 | | | 300,00 | | |
| Velocity m/s | | 1,88 | | | 1,08e-2 | | |
| Pressure Drop, Allow/Calc kPa | | 0,000 0,315 | | | 0,000 5,80e-3 | | |
| Average Film Coefficient W/m2-K | | 1056,3 | | | 650,58 | | |
| Fouling Resistance (min) m2-K/W | | 0,000000 | | | 0,000000 | | |
| Heat Exchanged 6,28e-4 MegaWatts | | MTD (Corrected) 31,5 C | | Overdesign 452,01 % | | | |
| Transfer Rate, Service 64,63 W/m2-K | | Calculated 356,75 W/m2-K | | Clean 356,75 W/m2-K | | | |
| CONSTRUCTION OF ONE SHELL | | | | | Sketch (Bundle/Nozzle Orientation) | | |
| | | Shell Side | | Tube Side | |  | |
| Design Pressure kPaG | | 517,11 | | 517,11 | | | |
| Design Temperature C | | 93,33 | | 37,78 | | | |
| No Passes per Shell | | 1 | | 1 | | | |
| Flow Direction | | Downward | | | | | |
| Connections | | 1 @ 15,799 | | 1 @ 15,799 | | | |
| Size & Rating | | 1 @ 20,930 | | 1 @ 15,799 | | | |
| Tube No. 25,000 | | OD 9,525 mm | Thk(Avg) 0,711 mm | Length 0,450 m | Pitch 11,906 mm | Tube pattern 30 | |
| Tube Type Plain | | Material 316 Stainless steel (17 Cr, 12 Ni) | | | | Pairs seal strips 0 | |
| Shell ID 80,000 mm | | Kettle ID mm | | | | Passlane Seal Rod No. 0 | |
| Cross Baffle Type None | | %Cut (Diam) | | | | Impingement Plate None | |
| Spacing(c/c) 411,90 mm | | Inlet mm | | | | No. of Crosspasses 1 | |
| Rho-V2-Inlet Nozzle 327,52 kg/m-s2 | | Shell Entrance 217,05 kg/m-s2 | | Shell Exit 0,00 kg/m-s2 | | | |
| | | Bundle Entrance 0,00 kg/m-s2 | | Bundle Exit 0,00 kg/m-s2 | | | |
| Weight/Shell 104,55 kg | | Filled with Water 107,17 kg | | Bundle 3,02 kg | | | |
| Notes: | | Thermal Resistance, % | | Velocities; m/s | | Flow Fractions | |
| | | Shell 33,77 | | Shellside 1,88 | | A | |
| | | Tube 64,45 | | Tubeside 1,08e-2 | | B 0,658 | |
| | | Fouling 0,00 | | Crossflow 0,00 | | C 0,342 | |
| | | Metal 1,77 | | Window 2,09 | | E | |
| | | | | | | F | |