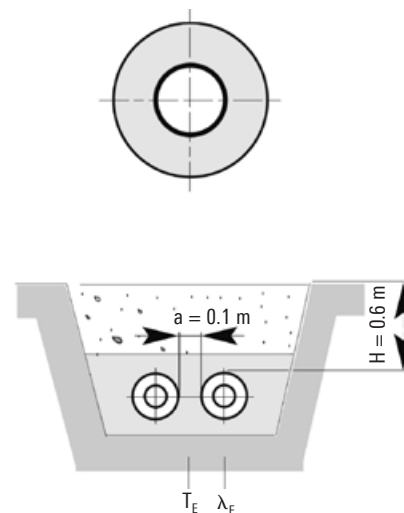


Heat loss

Heating, 6 bar

CALPEX® UNO

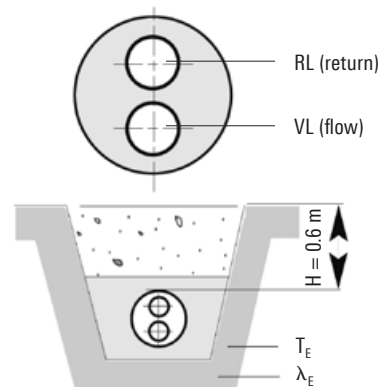
| Heat losses q [W/m] for one UNO pipe | | | | | | | |
|--------------------------------------|----------------|---|-------|-------|-------|-------|-------|
| CALPEX® UNO | U-value [W/mK] | Average operating temperature T _B [°C] | | | | | |
| | | 40° | 50° | 60° | 70° | 80° | 90° |
| 25/ 76 | 0.1165 | 3.50 | 4.66 | 5.83 | 6.99 | 8.16 | 9.32 |
| 32/ 76 | 0.1479 | 4.44 | 5.92 | 7.40 | 8.87 | 10.35 | 11.83 |
| 40/ 91 | 0.1543 | 4.63 | 6.17 | 7.72 | 9.26 | 10.80 | 12.34 |
| 50/111 | 0.1593 | 4.78 | 6.37 | 7.97 | 9.56 | 11.15 | 12.74 |
| 63/126 | 0.1809 | 5.43 | 7.24 | 9.05 | 10.85 | 12.66 | 14.47 |
| 75/142 | 0.1958 | 5.87 | 7.83 | 9.79 | 11.75 | 13.71 | 15.66 |
| 90/162 | 0.2116 | 6.35 | 8.46 | 10.58 | 12.70 | 14.81 | 16.93 |
| 110/162 | 0.3047 | 9.14 | 12.19 | 15.24 | 18.28 | 21.33 | 24.38 |
| 110/182 PLUS | 0.2419 | 7.26 | 9.68 | 12.10 | 14.51 | 16.93 | 19.35 |
| 125/182 | 0.3132 | 9.40 | 12.53 | 15.66 | 18.79 | 21.92 | 25.06 |
| 160/250 | 0.3180 | 9.60 | 12.80 | 15.90 | 19.10 | 22.30 | 25.50 |



CALPEX® DUO

(flow and return in one pipe)

| Heat losses q [W/m] for one DUO pipe | | | | | | | |
|--------------------------------------|----------------|---|-------|-------|-------|-------|-------|
| CALPEX® DUO | U-value [W/mK] | Average operating temperature T _B [°C] | | | | | |
| | | 40° | 50° | 60° | 70° | 80° | 90° |
| 25 + 25/ 91 | 0.179 | 5.37 | 7.16 | 8.95 | 10.74 | 12.53 | 14.32 |
| 32 + 32/111 | 0.185 | 5.55 | 7.40 | 9.25 | 11.10 | 12.95 | 14.80 |
| 40 + 40/126 | 0.210 | 6.30 | 8.40 | 10.50 | 12.60 | 14.70 | 16.80 |
| 50 + 50/162 | 0.196 | 5.88 | 7.84 | 9.80 | 11.76 | 13.72 | 15.68 |
| 63 + 63/182 | 0.269 | 8.10 | 10.80 | 13.50 | 16.10 | 18.80 | 21.50 |



Type of installation, CPX UNO: 2-pipe, laid in the ground
 Type of installation, CPX DUO: 1-pipe, laid in the ground
 Pipe distance: a = 0.10 m
 Cover above pipe: H = 0.60 m
 Ground temperature: T_E = 10 °C
 Soil conductivity: λ_E = 1.2 W/mK
 Conductivity of PUR foam: λ_{PU} = 0.0216 W/mK
 Conductivity of PEX pipe: λ_{PEXa} = 0.38 W/mK
 Conductivity of PE pipe: λ_{PE} = 0.33 W/mK

Heat loss during operation:

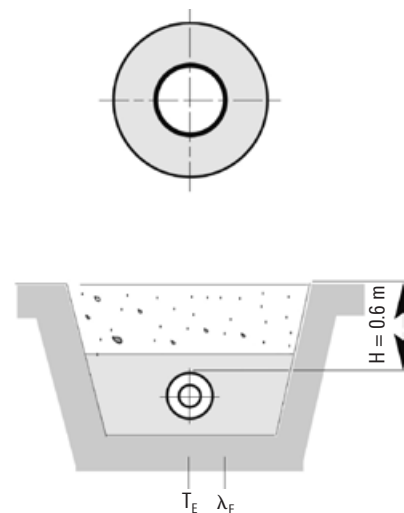
q = U (T_B - T_E) [W/m]
 U = Heat transfer coefficient [W/mK]
 T_B = Average operating temperature [°C]
 T_E = Average ground temperature [°C]
 VL = Flow
 RL = Return

Heat loss

Sanitary, 10 bar

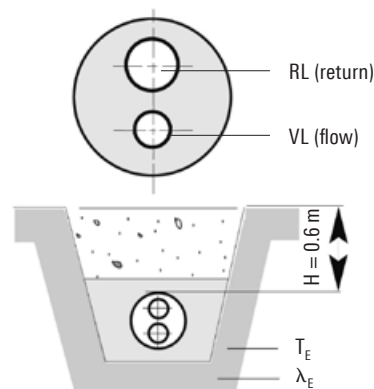
CALPEX® UNO

| Heat losses q [W/m] for one UNO pipe | | | | | |
|--------------------------------------|----------------|---|------|------|-------|
| CALPEX® UNO | U-value [W/mK] | Average operating temperature T _B [°C] | | | |
| | | 40° | 50° | 60° | 70° |
| 22/ 76 | 0.1151 | 3.45 | 4.60 | 5.76 | 6.91 |
| 28/ 76 | 0.1417 | 4.25 | 5.67 | 7.09 | 8.50 |
| 32/ 76 | 0.1628 | 4.88 | 6.51 | 8.14 | 9.77 |
| 40/ 91 | 0.1691 | 5.07 | 6.76 | 8.46 | 10.15 |
| 50/111 | 0.1747 | 5.24 | 6.99 | 8.74 | 10.48 |
| 63/126 | 0.1988 | 5.96 | 7.95 | 9.94 | 11.93 |
| 32/111 HBK | 0.1154 | 3.46 | 4.62 | 5.77 | 6.92 |
| 40/126 HBK | 0.1244 | 3.73 | 4.98 | 6.22 | 7.46 |
| 50/126 HBK | 0.1534 | 4.60 | 6.14 | 7.67 | 9.20 |



CALPEX® DUO

| Heat losses q [W/m] for one DUO pipe | | | | | |
|--------------------------------------|----------------|---|-------|-------|-------|
| CALPEX® DUO | U-value [W/mK] | Average operating temperature T _B [°C] | | | |
| | | 40° | 50° | 60° | 70° |
| 28 + 22/ 91 | 0.202 | 6.05 | 8.07 | 10.09 | 12.11 |
| 32 + 22/111 | 0.186 | 5.57 | 7.42 | 9.28 | 11.14 |
| 40 + 28/126 | 0.208 | 6.25 | 8.33 | 10.41 | 12.49 |
| 50 + 32/126 | 0.300 | 9.00 | 12.00 | 15.00 | 18.00 |



Type of installation, CPX UNO: 1-pipe, laid in the ground
 Type of installation, CPX DUO: 1-pipe, laid in the ground
 Cover above pipe: H = 0.60 m
 Ground temperature: T_E = 10 °C
 Soil conductivity: λ_E = 1.2 W/mK
 Conductivity of PUR foam: λ_{PU} = 0.0234 W/mK
 Conductivity of PEX pipe: λ_{PEXa} = 0.38 W/mK
 Conductivity of PE pipe: λ_{PE} = 0.33 W/mK

Heat loss during operation:

$$q = U (T_B - T_E) \text{ [W/m]}$$

U = Heat transfer coefficient [W/mK]
 T_B = Average operating temperature [°C]
 T_E = Average ground temperature [°C]

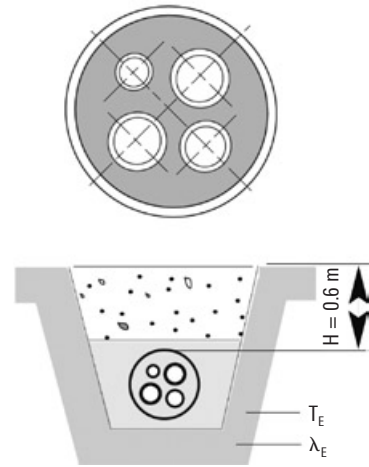
CALPEX® district heating pipe

Heat loss

Heating 6 bar, sanitary 10 bar, QUADRIGA

CALPEX® QUADRIGA

| Heat losses q [W/m] for one QUADRIGA pipe | | | | | |
|---|-------------------|---|-------|-------|-------|
| CALPEX® QUADRIGA | U-value [W/mK] | Average operating temperature T _B [°C] | | | |
| | | 50° | 55° | 60° | 65° |
| H 25 + 25/S 28 + 22/142 | 0.159 | 7.93 | 8.72 | 9.51 | 10.30 |
| H 32 + 32/S 28 + 22/142 | 0.184 | 9.18 | 10.10 | 11.02 | 11.93 |
| H 32 + 32/S 32 + 22/142 | 0.199 | 9.96 | 10.96 | 11.95 | 12.95 |
| H 40 + 40/S 40 + 28/162 | 0.235 | 11.75 | 12.93 | 14.10 | 15.28 |



Type of installation for QUADRIGA: 1-pipe, laid in the ground

- Cover above pipe: H = 0.60 m
- Ground temperature: T_E = 10 °C
- Soil conductivity: λ_E = 1.2 W/mK
- Conductivity of PUR foam: λ_{PU} = 0.0234 W/mK
- Conductivity of PEXa pipe: λ_{PEX} = 0.38 W/mK
- Conductivity of PE pipe: λ_{PE} = 0.33 W/mK

Heat loss during operation:

- q = U (T_B - T_E) [W/m]**
- U = Heat transfer coefficient [W/mK]
- T_B = Average operating temperature [°C]
- T_E = Average ground temperature [°C]

CALPEX® QUADRIGA - heat loss during operation

Example of calculation for average operating temperature T_B [°C]

- Flow - heating: 70 °C
- Return - heating: 40 °C
- Flow - sanitary: 60 °C
- Return - sanitary: 50 °C

$$T_B = \frac{70^\circ + 40^\circ + 60^\circ + 50^\circ}{4} = 55^\circ \text{C}$$