STEAM · THERMAL FLUID · PROCESS HEATING

DAMP · TERMISK OLIE · PROCESOPVARMNING

GEOMETRY & MATH | GEOMETRI & MATEMATIK

Cylindrical (Tube) Volume $V = \pi / 4 \cdot d^2 \cdot L$ [m³]

Cylindrical (Tube) Surface $A = \pi \cdot d \cdot L$ [m²]

Diameter $d = \sqrt{4 \cdot A / \pi}$ [m] $\pi = 3{,}1415927$

Rectangular Triangle A = 90°: Geometrical Vector Sum

$a^2 = b^2 + c^2 \Leftrightarrow a = \sqrt{b^2 + c^2}$ [m]

$\cos B = b / a$; $\sin B = c / a$; $\tan B = c / b$

STRENGTH & STATICS | STYRKELÆRE & STATIK

Force $F = m \cdot a$ [N]
Stress $\sigma = F / A$ [N/m²]
Stress $\sigma = \varepsilon \cdot E$ [N/m²] Hook's Law
Strain $\varepsilon = \Delta L / L$ [-]
A = Cross section area [m²]
E = Elasticity Modulus [N/m²]
m = Mass [kg]
a = Acceleration / Gravity Acceleration [m/s²]
ΔL = Elongation [m] ; L= Length [m]

Bending Stress in beams $\sigma = M_T / W$ [N/m²]
M_T = Torque [Nm]
W = Section Modulus [m³] profile depending

Simple Supported Beam – Uniform spread load
Max. torque $M_{T,MAX} = P \cdot L / 8$ [N·m]
at middle of the beam
Max. Deflection $U = 5 \cdot M \cdot L^2 / (48 \cdot E \cdot I)$ [m]
at middle

Cantilever Beam – Uniform spread load
Max. torque $M_{T,MAX} = P \cdot L / 2$ [N·m]
at the fixed support in the wall
Max. Deflection $U = M_{T,MAX} \cdot L^2 / (4 \cdot E \cdot I)$ [m]
at free end of the beam

P = Total uniform load of beam [N]
I = Moment of Inertia [m⁴]

HEAT & TEMPERATURES | VARME & TEMPERATUR

Absolute Temperature (Kelvin)
$T = t + 273{,}15$ [K]
t = Temperature [°C]

Heat / Heat Content $Q = m \cdot C_p \cdot (t_2 - t_1)$ [W] / [J]
m = Mass Flow [kg/s] / Mass [kg]
C_p = Specific Heat [J/(kgK]
t_1 and t_2 = Temperatures Inlet and Outlet [K] | [°C]

Linearly Heat Expansion of Materials
$\Delta L = L \cdot \alpha_L \cdot \Delta t$ [m]

Volumetric Heat Expansion of Materials
$\Delta V = V \cdot \beta_V \cdot \Delta t$ [m³]
L = Length [m] ; V = Volume [m³] ;
α_L = Length Expansion Coefficient [1/°C]
β_V = Volume Expansion Coefficient [1/°C]
Δt = Temperature Change [°C]

For Ideal Gasses :
$p \cdot v = R \cdot T = p_0 \cdot v_0 \cdot (1 + t / 273{,}15)$
Specific Volume $v = 1 / \rho$ [m³/kg]
p = Pressure (bar abs.) ; ρ= Density [kg/ m³]
T = Absolute Temperature [K]
$p_0 \cdot v_0$: Pressure and Specific volume at 0°C

R = Gas Coefficient [J/(kg·K)] :
Air = 287,1 J/(kg·K) Steam = 461,5 J/(kg·K)

1 kmol equals a volume of 22,4138 m³

$m = n \cdot M$ [kg]
$V_n = n \cdot V_{mol}$ [m_n^3] at 0°C and 1,01325 bar
$\rho = m / V_n$ [kg/m_n^3]

M = Mol mass [kg/mol] ; ρ = Density [kg/m_n^3]
V_n = Normal Volume [m_n^3] ; n = Number of mol
V_{mol} = Molar Volume [m_n^3/mol] ; m = mass [kg]

MECHANICS OF FLUIDS | STRØMNING & VÆSKEFYSIK

Total pressure $p_T = p_S + p_D$ [N/m²]
Dynamic pressure $p_D = ½ \cdot c^2 \cdot \rho$ [N/m²]
Pressure Height $p_H = g \cdot \rho \cdot H$ [N/m²]

p_S = Static pressure [N/m²]
g = Gravity acceleration [m/s²]
H = Height / Altitude [m]

Bernoulli's Law about constancy in pressure. All in [N/m²]
$p_{S,1} + p_{D,1} + p_{H,1} = p_{S,2} + p_{D,2} + p_{H,2} \Leftrightarrow$
$p_{S,1} + ½ \cdot c_1^2 \cdot \rho + g \cdot \rho \cdot H_1 = p_{S,2} + ½ \cdot c_2^2 \cdot \rho + g \cdot \rho \cdot H_2$

For Ideal Gasses:
Dynamic Viscosity $\eta \cong \eta_0 \cdot (273 + t) / 273$ [N·s/m²]
t = Temperature [°C]

Dynamic Viscosity $\eta = \nu \cdot \rho$ [Pa·s] | [kg/(m·s)]
Reynold's Number $Re = c \cdot L_F / \nu$ [-]
ν = Kinematic Viscosity [m²/s] ; ρ = Density [kg/m³]
c = Velocity [m/s]; L_F = Flow Length [m]

Pressure Drop in tube $\Delta p_{TB} = \lambda \cdot p_D \cdot L_T / d$
$= \lambda \cdot ½ \cdot \rho \cdot c^2 \cdot L_T / d$ [N/m²]
λ = Friction Coefficient [-]; L_T = Tube Length [m]
d = Internal Tube Diameter [m]; ρ = Density [kg/m³]
c = Velocity [m/s]

Pump Capacity $P = \eta_T \cdot q_V \cdot \Sigma \Delta p$ [W]
Total Efficiency $\eta_T = (\eta_{PUMP} \cdot \eta_{MOTOR})$
Efficiency $\eta = P_{PERFORMED} / P_{ABSORB}$
q_V = Volume flow [m³/s]
ΣΔp = Sum of all pressure drops in the circuit [Pa]

HEAT TRANSFER | VARMEOVERFØRING

BY CONVECTION | VED KONVEKTION

Heat Transfer by Convection $Q = k \cdot F \cdot \Delta\vartheta$ [W]
F = Heat Surface – Total wall area [m²]

Heat Transmission Coefficient
$k = 1 / (1/\alpha_1 + 1/\alpha_2 + e/\lambda + f_1 + f_2)$ [W/(m²·K)]
α_1 = Heat Transfer Coefficient – Fluid 1 [W/(m²·K)]
α_2 = Heat Transfer Coefficient – Fluid 2 [W/(m²·K)]
λ = Heat Conductivity Wall Material [W/(m·K)]
e = Wall Thickness [m]
f_1 = Fouling Coefficient – for the wall of fluid 1 [m²·K/W)]
f_2 = Fouling Coefficient – for the wall of fluid 2 [m²·K/W)]

Logarithmic Middle Temperature Difference
$\Delta\vartheta = (\Delta t_1 - \Delta t_2) / \ln(\Delta t_1 / \Delta t_2)$; all values in [K] | [°C]
Δt_1 = Difference in Temperatures of Fluid1 and Fluid 2 at "1"
Δt_2 = Difference in Temperatures of Fluid1 and Fluid 2 at "2"
"1" and "2" being the physical positions of the inlets and outlets of heat exchanger in current or counter flow types

Nusselt's Number
$Nu = \alpha \cdot L_F / \lambda$ [-] $\Leftrightarrow \alpha = Nu \cdot \lambda / L_F$
α = Heat Transfer Coefficient [W/(m²·K)]
L_F = Flow Length [m] e.g. diameter or plate length
λ = Heat Conductivity Fluid [W/(m·K)]

General expression for forced circulation
$Nu = K_1 \cdot Re^{K2} \cdot Pr^{K3}$

General expression for natural circulation
$Nu = K_5 \cdot Gr^{K4} \cdot Pr^{K3}$
Prandtl's Number $Pr = \rho \cdot C_p \cdot \nu / \lambda$ [-]

Grashoff's Number $Gr = g \cdot \rho \cdot \Delta V \cdot \Delta t \cdot L_F^3 / \nu$ [-]

g = Gravity acceleration [m/s²]

K_1, K2, K3, K4 and K_5 are different constants and equations based on tests and depending on the type of heat transfer.

BY RADIATION | VED STRÅLING

Radiation Heat between two surfaces 1 and 2
$\Phi = C_{12} \cdot F_1 \cdot ((T_1/100)^4 - (T_2/100)^4)$ [W]

Radiation Coefficient
$C_{12} = 1 / (1/C_1 + 1/C_2 - 1/C_S)$ [W/(m²·K)]
$C = \varepsilon \cdot C_S$ [W/(m²·K)]
ε = Emission ratio [-]
C_S = Radiation Coefficient for the absolute black surface [-]
T = Absolute temperature [K]

ELECTRICITY | ELECTRICITET

Power / Capacity of a 1-Phase System :
$P = U_{PH} \cdot I_{PH}$ [W]

Power / Capacity of a 3-Phase System :
$P = \sqrt{3} \cdot U_N \cdot I_N \cdot \cos\varphi$ [W]

U_N = Net Voltage [V] ; I_N = Net Current [A]
U_{PH} = Phase Voltage [V] ; I_{PH} = Phase Current [A]
cos φ = Phase Angel [-]

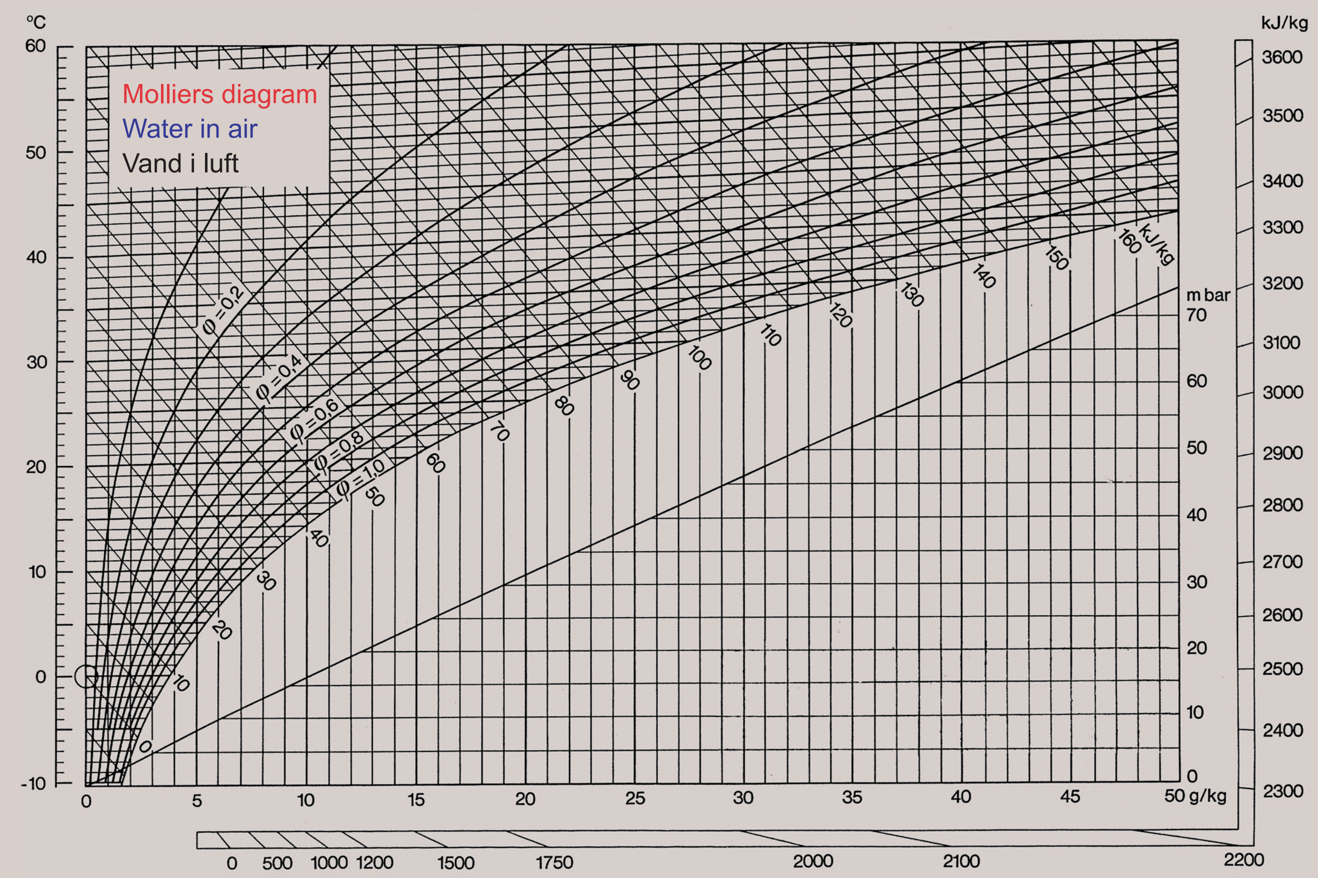
$\cos\varphi = 1$ for Heating elements etc.
$\cos\varphi < 1$ for Electrical Motors, inductive/capacitive resist.

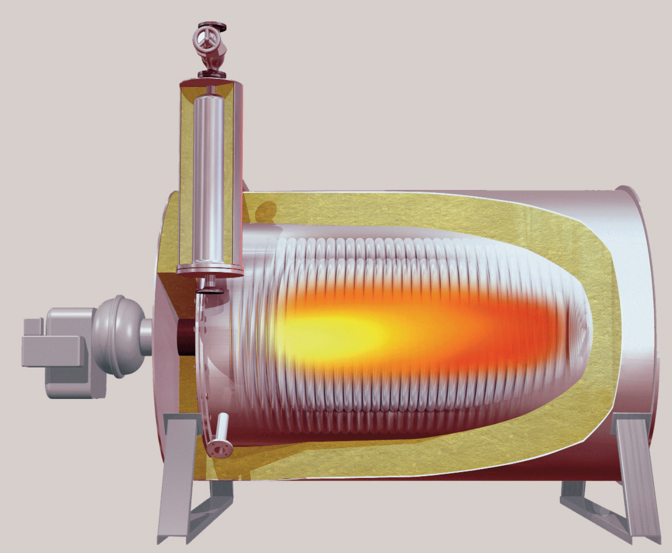
Power, Voltage and Current in Conventional Resistances

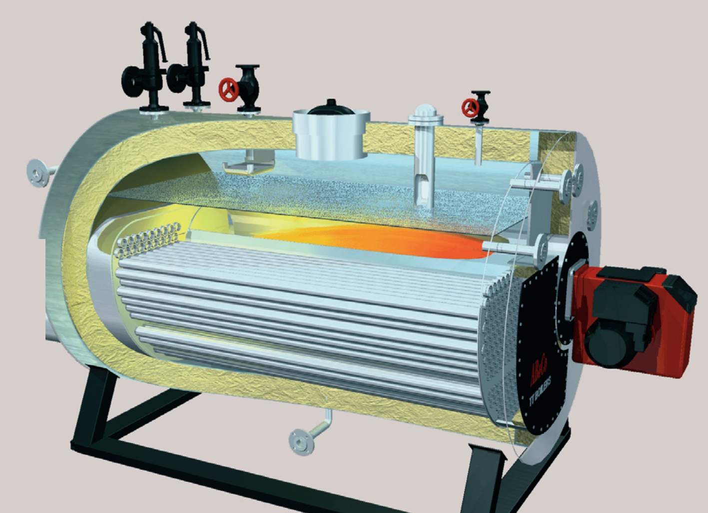
Ohm's Law
$U = R \cdot I$ [V]

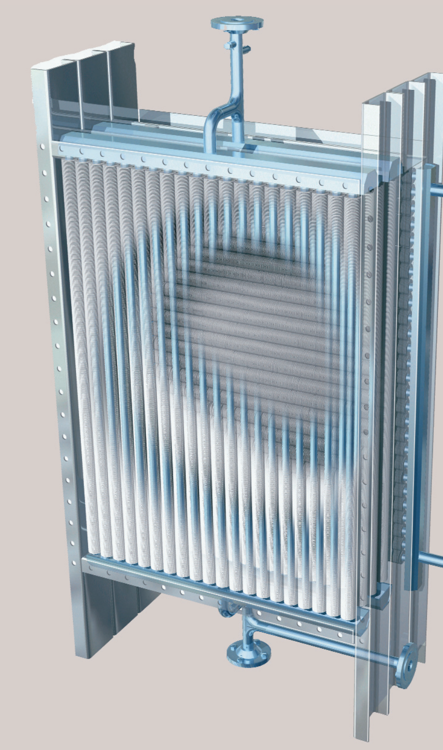
Power expressed by the resistance
$P = U \cdot I = U^2 / R = I^2 \cdot R$ [W]

U = Voltage [V] ; I = Current [A]
R = Resistance [Ω] | [Ohm]









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BASICS | GRUNDLÆGGENDE

Length | Længde

1	m	=	39,37	" | in	=	3,281	' | feet
1	in | "	=	25,40	mm	=	$2{,}540 \cdot 10^{-2}$	m
1	ft | '	=	304,8	mm	=	0,3048	m
1	Nautical Mile				=	1,853	km

Area | Areal

1	m²	=	10,76	ft²	=	1550	In²
1	ft²	=	$9{,}290 \cdot 10^{-2}$	m²			
1	In²	=	$6{,}452 \cdot 10^{-4}$	m²			

Volume | Volumen

1	m³	=	$6{,}102 \cdot 10^{4}$	in³			
1	m³	=	35,31	cf | ft³	=	264,2	US Gallon
1	cf | ft³	=	$2{,}832 \cdot 10^{-2}$	m³	=	28,32	Liter | dm³
1	in³	=	$1{,}639 \cdot 10^{-5}$	m³	=	$1{,}639 \cdot 10^{-2}$	Liter | dm³
1	US Gallon	=	$3{,}785 \cdot 10^{-3}$	m³	=	3,785	Liter | dm³
1	UK Gallon	=	$4{,}546 \cdot 10^{-3}$	m³	=	4,546	Liter | dm³

For ideal Gasses : Standard Cubicfeet (SCF) at 70°F (21,1°C) / 1 Atm. abs.
Normal cubicmeter (m_n^3) at 0°C / 1 Atm. abs. (1,013 bar)

1	*m_n^3 Air*	*=*	*38,04*	*SCF Air*	*=*	*1,292*	*kg Air*
1	*SCF Air*	*=*	*$2{,}629 \cdot 10^{-2}$*	*m_n^3 Air*	*=*	*$3{,}397 \cdot 10^{-2}$*	*kg Air*

Specific Volume | Specifik Volumen

1	m³/kg	=	16,02	ft³/lb
1	ft³/lb	=	$6{,}243 \cdot 10^{-2}$	m³/kg

Density | Massefylde

1	kg/m³	=	$6{,}243 \cdot 10^{-2}$	lb/ft³
1	lb/ft³	=	16,02	kg/m³

Mass | Masse

1	kg	=	2,205	lb | lbs
1	lb | lbs	=	0,4536	kg

FLUIDS & FLOW | VÆSKER & STRØMNING

Velocity | Hastighed

1	m/s	=	3,281	ft/s
1	m/s	=	196,9	ft/min | FPM
1	FPM	=	$5{,}080 \cdot 10^{-3}$	m/s
1	ft/sec.	=	0,3048	m/s
1	Knot	=	1,853	km/h
			1 Nautical Mile / hour	

Volume Flow | Volumenstrøm

1	m³/h	=	0,5885	CFM | ft³/min
1	CFM	=	1,699	m³/h

For ideal gasses :
Standard cubicfeet per Minute (SCFM) / 70°F / 1 Atm. abs.
Normal cubicmeter per hour (m_n^3/h) / 0°C / 1 Atm. abs.

1	SCFM luft	=	1,577	m_n^3/h Air (only)

Mass Flow | Massestrøm

1	kg/h	=	2,205	lb/h
1	lb/h	=	0,4536	kg/h

Pressure | Tryk

1	bar	=	14,50	psi
1	bar	=	100,0	kPa
1	bar	=	0,9869	Atm.
1	mbar	=	0,7501	mmHg | Torr
1	mbar	=	10,20	mmWG
1	mbar	=	100,0	Pa
1	psi | lbf/in²	=	$6{,}895 \cdot 10^{-2}$	bar
1	psi | lbf/in²	=	$6{,}804 \cdot 10^{-2}$	Atm.
1	psi | lbf/in²	=	6,895	kPa

Kinematic Viscosity | Kinematisk Viskositet

1	cSt	=	$1{,}076 \cdot 10^{-5}$	ft²/s
1	cSt	=	$1{,}000 \cdot 10^{-6}$	m²/s
1	ft²/s	=	$9{,}290 \cdot 10^{4}$	cSt
1	ft²/s	=	$9{,}290 \cdot 10^{-2}$	m²/s

Dynamic Viscosity | Dynamisk Viskositet

1	Pa·s	=	1.000	cP
1	Pa·s	=	0,6720	lb/(ft·s)
1	cP	=	$1{,}000 \cdot 10^{-3}$	Pa·s | Ns/m²
1	cP	=	$1{,}000 \cdot 10^{-3}$	kg/(m·s)
1	lb/(ft·s)	=	1,488	Pa·s
1	lb/(ft·s)	=	1488	cP | mPa·s

HEAT | VARME

Temperature | Temperatur

°C | Celsius = 5 · (°F – 32) / 9
°F | Fahrenheit = 32 + 9 · °C / 5

Heat Content & Energy | Varme & Energi

1	kJ | kN·m	=	0,9478	Btu
1	kJ | kN·m	=	0,2388	Kcal
1	Btu	=	1,055	kJ
1	Btu	=	0,2520	Kcal
1	kcal	=	4,187	kJ
1	kcal	=	3,968	Btu
1	kWh	=	3600	kJ
1	kWh	=	859,8	Kcal

Heat Load & Power | Effekt & Varmestrøm

1	kW	=	3412	Btu/h
1	kW	=	859,8	Kcal/h
1	Btu/h	=	$2{,}931 \cdot 10^{-4}$	kW
1	Btu/h	=	0,2520	Kcal/h
1	kcal/h	=	$1{,}163 \cdot 10^{-3}$	kW
1	kcal/h	=	3,968	Btu/h
1	Boiler HP	=	9,81	kW
1	Boiler HP	=	15,65	kg steam /h

Specific Heat | Varmefylde

1	kJ/(kg·K)	=	0,2388	Btu/(lb·°F)
1	kJ/(kg·K)	=	0,2388	kcal/(kg·°C)
1	Btu/(lb·°F)	=	4,187	kJ/(kg·K)
1	kcal/(kg·°C)	=	4,187	kJ/(kg·K)

Conductivity | Varmeledning

1	W/(m·K)	=	0,8598	kcal/(m·h·°C)
1	W/(m·K)	=	0,5778	Btu/(ft·h·°F)
1	kcal/(m·h·°C)	=	1,163	W/(m·K)
1	Btu/(ft·h·°F)	=	1,731	W/(m·K)

Heat Transmission | Varmetransmission

1	W/(m²·K)	=	0,8598	kcal/(m²·h·°C)
1	W/(m²·K)	=	0,1761	Btu/(ft²·h·°F)
1	kcal/(m²·h·°C)	=	1,163	W/(m²·K)
1	Btu/(ft²·h·°F)	=	5,679	W/(m²·K)

Evaporation Heat | Forvampningsvarme

1	kJ/kg	=	0,430	Btu/lb
1	Btu/lb	=	2,326	kJ/kg

STEAM | DAMP dry saturated

Pressure Absolute p bar abs.	Temperature t °C	Vapour Enthalpy H'' kJ/kg	Condensate Enthalpy H' kJ/kg	Evaporation Heat R_Q kJ/kg	Density ρ'' kg/m³	Specific Heat C_p'' kJ/(kg·K)	Heat Conductivity λ'' W/(m·K)	Dynamic Viscosity μ'' $x10^{-6}$ Pa·s
0,03	24,1	2.546	101	2.445	0,02	1,88	0,020	9,20
0,07	37,7	2.570	158	2.413	0,05	1,88	0,020	9,50
0,10	45,8	2.585	192	2.393	0,07	1,90	0,021	9,83
0,20	60,1	2.610	251	2.358	0,13	1,92	0,022	10,5
0,30	69,5	2.627	293	2.334	0,19	1,93	0,023	10,8
0,40	75,9	2.637	318	2.319	0,25	1,95	0,024	10,9
0,50	81,5	2.646	341	2.305	0,31	1,95	0,024	11,0
0,65	87,5	2.656	366	2.290	0,39	1,97	0,024	11,3
0,80	93,5	2.666	391	2.275	0,48	1,98	0,024	11,5
1,00	99,6	2.675	418	2.258	0,59	2,03	0,025	12,0
1,1	102,3	2.680	429	2.251	0,65	2,05	0,025	12,3
1,3	106,8	2.686	448	2.239	0,75	2,07	0,026	12,4
1,5	111,3	2.693	467	2.226	0,86	2,08	0,026	12,5
1,8	115,8	2.700	486	2.214	1,02	2,09	0,026	12,6
2,0	120,0	2.706	505	2.202	1,13	2,10	0,026	12,7
2,5	127,4	2.716	535	2.181	1,39	2,13	0,027	12,9
3,0	133,5	2.725	561	2.163	1,65	2,17	0,027	13,2
3,5	138,9	2.732	584	2.147	1,91	2,20	0,028	13,4
4,0	143,6	2.738	605	2.133	2,16	2,25	0,028	13,6
4,5	147,9	2.743	623	2.120	2,42	2,30	0,029	13,9
5	151,8	2.748	640	2.107	2,67	2,33	0,029	14,1
6	158,8	2.756	670	2.085	3,17	2,39	0,030	14,4
7	165,0	2.762	697	2.065	3,67	2,44	0,031	14,6
8	170,4	2.768	721	2.047	4,16	2,49	0,032	14,8
9	175,4	2.772	743	2.029	4,66	2,53	0,033	14,9
10	179,9	2.776	763	2.014	5,15	2,59	0,033	15,0
11	184,1	2.780	781	1.999	5,64	2,63	0,034	15,2
12	188,0	2.783	798	1.984	6,13	2,69	0,034	15,3
13	191,6	2.785	815	1.971	6,62	2,72	0,035	15,4
14	195,0	2.788	830	1.958	7,11	2,77	0,036	15,5
15	198,3	2.790	845	1.945	7,60	2,83	0,036	15,6
18	207,1	2.795	885	1.910	9,07	2,94	0,038	15,9
20	212,4	2.797	909	1.889	10,05	3,02	0,039	16,1
25	223,9	2.801	962	1.839	12,51	3,23	0,041	16,5
30	233,8	2.802	1.008	1.794	15,01	3,45	0,044	17,0
35	242,5	2.802	1.050	1.752	17,54	3,61	0,047	17,2
40	250,0	2.800	1.087	1.713	20,10	3,80	0,049	17,5
50	264,0	2.794	1.155	1.640	25,36	4,40	0,055	18,1
60	275,5	2.785	1.214	1.571	30,83	4,64	0,058	18,6
70	285,8	2.774	1.267	1.506	36,53	5,09	0,059	18,7
80	295,0	2.760	1.317	1.443	42,51	5,57	0,074	9,6
100	311,0	2.728	1.408	1.320	55,43	6,80	0,080	21
150	342,1	2.615	1.611	1.004	96,71	13,2	0,109	25
200	365,8	2.418	1.826	592	170,2	37	0,148	31

THERMAL FLUID | TERMISK OLIE typical white

Temperature t °C	Density ρ kg/m³	Specific Heat C_p kJ/(kg·K)	Heat Conductivity λ W/(m·K)	Dynamic Viscosity μ $x10^{-6}$ Pa·s	Prandtl's Number Pr -
-30	4.600	1,696	0,137	21.160.000	262.719
0	882,0	1,805	0,134	163.170	2.191
20	873,6	1,878	0,133	42.806	605
40	865,2	1,951	0,132	16.438	244
60	856,8	2,023	0,130	8.054	125
80	848,4	2,096	0,129	4.581	74,6
100	839,9	2,169	0,127	2.982	50,8
110	835,7	2,205	0,126	2.490	43,4
120	831,5	2,241	0,126	2.095	37,3
130	827,3	2,278	0,125	1.787	32,6
140	823,1	2,314	0,124	1.547	28,8
150	818,9	2,350	0,124	1.368	26,0
160	814,7	2,386	0,123	1.214	23,6
170	810,5	2,423	0,122	1.078	27,3
180	806,3	2,459	0,121	976	19,8
190	802,1	2,496	0,121	874	18,1
200	797,9	2,532	0,120	798	16,8
210	793,7	2,568	0,119	734	15,8
215	791,6	2,587	0,119	701	15,2
220	789,5	2,605	0,119	667	14,7
225	787,4	2,623	0,118	642	14,3
230	785,3	2,641	0,118	618	13,9
235	783,2	2,659	0,117	595	13,5
240	781,1	2,678	0,117	573	13,1
245	779,0	2,696	0,117	550	12,7
250	776,9	2,714	0,116	528	12,3
255	774,8	2,732	0,116	511	12,0
260	772,6	2,750	0,116	494	11,8
265	770,5	2,768	0,115	475	11,4
270	768,4	2,786	0,115	456	11,1
275	766,3	2,805	0,115	443	10,8
280	764,2	2,823	0,114	430	10,6
285	762,1	2,841	0,114	415	10,4
290	760,0	2,859	0,114	401	10,1
295	757,9	2,877	0,113	388	9,9
300	755,8	2,895	0,113	375	9,6
305	753,7	2,913	0,112	364	9,4
310	751,6	2,932	0,112	353	9,2
315	749,5	2,950	0,112	343	9,0
320	747,4	2,968	0,111	332	8,8
325	745,3	2,986	0,111	326	8,8
330	743,2	3,005	0,111	314	8,5
335	741,1	3,023	0,110	307	8,4
340	739,0	3,041	0,110	297	8,2

WATER | VAND pure H_2O

Temperature t °C	Density ρ kg/m³	Specific Heat C_p kJ/(kg·K)	Heat Conductivity λ W/(m·K)	Dynamic Viscosity μ $x10^{-6}$ Pa·s	Prandtl's Number Pr -
-5	1.035	3,850	0,444	10.000	40,0
0	999,8	4,218	0,569	1.750	13,0
1	999,8	4,215	0,571	1.705	12,6
2	999,8	4,213	0,573	1.660	12,3
3	999,8	4,210	0,574	1.615	11,9
4	999,8	4,208	0,576	1.570	11,5
5	999,8	4,205	0,578	1.525	11,1
6	999,7	4,202	0,580	1.480	10,8
7	999,7	4,200	0,582	1.435	10,4
8	999,7	4,197	0,583	1.390	10,0
9	999,7	4,195	0,585	1.345	9,65
10	999,7	4,192	0,587	1.300	9,28
11	999,6	4,191	0,589	1.270	9,05
12	999,4	4,190	0,590	1.240	8,81
13	999,3	4,189	0,592	1.210	8,58
14	999,1	4,188	0,594	1.180	8,34
16	998,8	4,186	0,597	1.120	7,88
18	998,5	4,184	0,601	1.060	7,41
20	998,2	4,182	0,604	1.000	6,94
22	997,7	4,181	0,607	959,6	6,63
24	997,2	4,180	0,610	919,2	6,32
25	997,0	4,180	0,611	899,0	6,17
30	995,7	4,178	0,618	798,0	5,39
35	994,3	4,178	0,625	725,5	4,85
40	992,2	4,178	0,632	653,0	4,30
45	990,1	4,180	0,638	599,5	3,93
50	988,0	4,181	0,643	546,0	3,56
55	985,6	4,183	0,649	506,0	3,26
60	983,2	4,184	0,654	466,0	2,96
65	980,5	4,187	0,658	435,0	2,75
70	977,8	4,190	0,662	404,0	2,53
75	974,8	4,193	0,666	379,5	2,37
80	971,8	4,196	0,669	355,0	2,20
85	968,6	4,201	0,673	335,0	2,07
90	965,3	4,205	0,676	315,0	1,94
100	958,1	4,216	0,681	279,0	1,73
110	951,1	4,230	0,684	252,8	1,56
120	942,8	4,244	0,687	231,0	1,43
130	934,6	4,263	0,688	211,9	1,31
140	925,7	4,285	0,688	195,5	1,22
150	916,3	4,311	0,687	181,4	1,14
200	864,7	4,495	0,665	133,9	0,91
300	712,2	5,773	0,541	90,10	0,96
374,15	315,5	1.000	0,238	45,00	1.000

AIR | LUFT dry condition at 1 bar abs. = 0,987 Atm.

Temperature t °C	Density ρ kg/m³	Specific Heat C_p kJ/(kg·K)	Heat Conductivity λ W/(m·K)	Dynamic Viscosity μ $x10^{-6}$ Pa·s	Prandtl's Number Pr -
-50	1,570	1,007	0,020	14,50	0,710
-30	1,430	1,006	0,022	15,50	0,709
-20	1,377	1,006	0,023	16,15	0,710
-10	1,326	1,006	0,024	16,63	0,705
0	1,275	1,006	0,025	17,10	0,700
5	1,254	1,006	0,025	17,28	0,700
10	1,232	1,007	0,025	17,50	0,700
15	1,210	1,007	0,026	17,72	0,700
20	1,188	1,007	0,026	17,98	0,700
25	1,169	1,007	0,026	18,19	0,698
30	1,150	1,008	0,027	18,40	0,695
35	1,131	1,008	0,027	18,60	0,693
40	1,112	1,008	0,028	18,81	0,690
45	1,095	1,008	0,028	19,04	0,690
50	1,079	1,009	0,028	19,27	0,690
55	1,062	1,009	0,029	19,50	0,690
60	1,045	1,009	0,029	19,73	0,690
65	1,030	1,009	0,029	19,98	0,690
70	1,016	1,010	0,030	20,23	0,690
75	1,001	1,010	0,030	20,48	0,690
80	0,986	1,010	0,030	20,73	0,690
85	0,973	1,011	0,031	20,95	0,690
90	0,959	1,011	0,031	21,17	0,690
100	0,933	1,012	0,032	21,60	0,690
110	0,909	1,013	0,033	22,02	0,685
120	0,885	1,014	0,033	22,43	0,680
130	0,864	1,016	0,034	22,81	0,680
140	0,843	1,017	0,035	23,19	0,680
150	0,823	1,019	0,035	23,60	0,680
160	0,804	1,020	0,036	24,01	0,680
170	0,786	1,022	0,037	24,46	0,680
180	0,768	1,023	0,038	24,91	0,680
190	0,752	1,025	0,038	25,31	0,680
200	0,736	1,026	0,039	25,70	0,680
250	0,666	1,035	0,043	27,41	0,671
300	0,607	1,046	0,046	29,20	0,670
350	0,557	1,057	0,050	31,39	0,661
400	0,517	1,069	0,053	32,55	0,660
450	0,481	1,081	0,056	34,00	0,660
500	0,450	1,093	0,058	35,50	0,660
600	0,399	1,116	0,064	38,30	0,670
800	0,324	1,155	0,071	43,32	0,700
1000	0,273	1,185	0,077	47,88	0,740
1200	0,235	1,220	0,095	55,00	0,690