



Heat pump



TWW 245 HD *Modul*

WAMAK TWW 245 HD Modul

Product description

High-efficiency heat pump consisting of multiple modules of separate heat pumps. A wide range of applications from heating, cooling and domestic hot water heating of office or multifunctional buildings, to industrial applications in cascade connection.

Use for demanding industrial applications. By combining the most suitable performance and application variants of heat pump modules, it is possible to tailor-make the complete system required. Each module is refrigeration, hydraulically and electrically isolated with a separate controller. The connection of the modules is cascaded, whereby each single controller can take over the function of the cascade master.

As a primary source, thermal energy from underground water at a depth of between 12 and 30 metres is used. A submersible pump delivers the groundwater to the heat pump and, depending on the quality and chemical composition, the heat from the groundwater is extracted either directly in the heat pump or through a separating heat exchanger with an intermediate circuit and antifreeze. The heat pump then raises this temperature to a usable temperature for heating or hot water.

The twin compressors give the system robustness and the ability to distribute the heat output according to the actual load.

Product features

- Scroll compressor
- Electronic expansion valve
- Two-stage capacity control
- Compressor soft starter
- High pressure switch
- Low pressure sensor - analogue
- Flow sensor consumer - analogue - (with accessory)
- Outdoor temperature sensor
- Buffer temperature sensor
- Modbus connection
- Sylomer pads under compressor unit
- Asymmetric plate heat exchanger
- Multi-stage capacity control
- Phase and rotation control
- High pressure sensor - analogue
- Flow switch consumer - on/off - (with accessory)
- Flow switch source - on/off - (with accessory)
- DHW temperature sensor
- Cascade control
- Solid frame structure

Basic performance data - WAMAK TW 245 HD Modul

Heating - EN 14511		
Heating capacity [kW]	W10 / W35 (max)	251.1 (125.5 / 251.1)
	W10 / W35 (min)	125.5 (125.5 / 251.1)
	W10 / W34	252.8 (126.4 / 252.8)
Electrical power input [kW]	W10 / W35 (max)	40.8 (20.1 / 40.8)
	W10 / W35 (min)	20.1 (20.1 / 40.8)
	W10 / W34	40.0 (27.7 / 56.2)
Heating efficiency faktor [COP]	W10 / W35 (max)	6.16
	W10 / W35 (min)	6.24
	W10 / W34	6.32
Seasonal space heating energy efficiency - SCOP EN 14825		
Average Climate / Low Temperature [35°C]	SCOP	7.11
	η [%]	284.2
	Label	A+++
	Qhe [kWh]	518772.6
	Pdesignh [kW]	251.1
	Tbivalent [°C]	-10
Cooling		
Cooling capacity - [kW]	A35 / W23-18	186.2
	A25 / W23-18	210.4
	A35 / W12-7	128.5
	A25 / W12-7	128.5
Seasonal space cooling energy efficiency - SEER EN 14825		
[W 23 / 18°C]	SEER	5.84
	Qce [kWh]	77100.0
	ηc [%]	233.7
Sound EN 12102		
Acoustic power - Lw	dB(A)	71
Acoustic pressure - Lp	1 m dB(A)	63
	5 m dB(A)	49
	10 m dB(A)	43
Mechanical and operational information		
Compressor type (3~ 400/50)	SCROLL / 2 /	On/Off
Refrigerant	R410A (GWP - 2088)	21.7 kg
Operating limit temperatures heating - (min / max) [°C]	25 / 60	
Operating limit temperatures source - (min / max) [°C]	-10 (7) / 20	
Weight	900 kg	

Main technical data - WAMAK TWW 245 HD Modul

Enclosure type			Heat energy rejection side data				
Basic dimensions	Height [mm]	2000	Operating limit temperatures heating	MAX [°C]	60		
	Width [mm]	1500		MIN [°C]	25		
	Length [mm]	1200	for more see operating limits diagram				
Weight [kg]	900	Condenser	Port size	VIC 3 "			
Colour	Gray		Type	BPHE			
Enclosure IP Class	IP20		Count	1			
Refrigeration cycle			Material	AISI 316			
Compressor	Type	Scroll	Maximal operating pressure - refrigerant [bar]	45			
	Number of stages	2	Maximal operating pressure - Water [bar]	3			
	On/Off		Testing pressure [bar]	70			
	Power factor Cosφ	0.62	Heat transfer medium	Water			
	Winding resistance	0.36 Ohm	Volume flow - Water [m³/h]	21.71 ~ 43.42			
Refrigerant	R410A		Internal pressure drop - Water [kPa]	20			
	Volme	21.7 kg	Temperature difference @ 35°C (nom)	5 K			
	GWP	2088	@ 55°C	8 K			
	Safety class	A1	@ 65°C	10 K			
Refrigeration oil type			Renewable energy extraction side data				
POE RL32-3MAF			Operating limit temperatures source	MIN [°C]	-10 (7)		
Oil volume				MAX [°C]	20		
Maximal pressure - refrigerant [bar]			for more see operating limits diagram				
45			Evaporator	Port size	VIC 4 "		
PED class				Type	BPHE		
2				Count	1		
EVI - vapour injection with economizer				Material	AISI 316		
Electrical connection data							
Line voltage [#~ V/Hz]			Maximal operating pressure - refrigerant [bar]				
3~ 400/50				29			
Current	nominal [A]	69.76	Heat transfer medium				
	maximal [A]	130.80	Maximal operating pressure - Water [bar]				
	starting [A]	73.05		3			
Softstart			Volume flow - Water [m³/h]				
2 x MCD 201				22.74 ~ 45.47			
Main safety			Internal pressure drop - Water [kPa]				
Control System				20			
Main controller	SIEMENS	RVS 21 AVS 55.199	Temperature difference - Water				
Extension module	AVS75.3xx	AVS75.3xx		4 K			
Bus Clip-In	LPB OCI346		for accessory				
Online connection	Web server OZW672			with accessory			
Superheat controller	Carel EEV Cont						
*** with accessory							

WAMAK TWW 245 HD Modul

ErP (EU) No 811/2013: Technical parameters for heat pump space heaters

Model	TWW 245 HD Modul
Air-to-water heat pump	no
Brine-to-water heat pump	no
Water-to-water heat pump	yes
Low-temperature heat pump	no
Equipped with a supplementary heater	no
Heat pump combination heater	no
Temperature application	low (35 °C - 30 °C)
Climate conditions	average

Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated heat output at Tdesignh	Prated	251.1	kW	Seasonal space heating energy efficiency	ηs	284.2	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	Pdh	252.8	kW	Tj = -7 °C	COPd	6.32	-
Tj = +2 °C	Pdh	259.6	kW	Tj = +2 °C	COPd	7.0	-
Tj = +7 °C	Pdh	132.3	kW	Tj = +7 °C	COPd	7.6	-
Tj = +12 °C	Pdh	134.8	kW	Tj = +12 °C	COPd	8.1	-
Tj = bivalent temperature	Pdh	251.1	kW	Tj = bivalent temperature	COPd	6.2	-
Tj = operation limit temperature	Pdh	---	kW	Tj = operation limit temperature	COPd	---	-
Bivalent temperature	Tbiv	-10	°C	Tj = operation limit temperature	TOL	---	°C
Power consumption in modes other than active mode				Heating water operating limit temperature	WTOL	60	°C
Off mode	Poff	0.010	kW	Supplementary heater			
Thermostat-off mode	Pto	0.010	kW	Rated heat output	Psup	35.1	kW
Standby mode	Psb	0.010	kW	Type of energy input			
Crankcase heater mode	Pck	0.000	kW	For air-to-water heat pumps: Rated air flow rate, outdoors	-	---	m3/h
Other items				For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	22.74 ~ 45.47	m3/h
Capacity control		multi-stage					
Sound power level							
indoors	Lwa	71	dB				
outdoors	Lwa	---	dB				
Annual energy consumption	QHE	518772.6	kWh				

Contact details: WAMAK, s.r.o., Orovnička 252, 96652, Orovnička, Slovensko, info@wamak.sk

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ErP (EU) No 811/2013: Technical parameters for heat pump space heaters

Model	TWW 245 HD Modul
Air-to-water heat pump	no
Brine-to-water heat pump	no
Water-to-water heat pump	yes
Low-temperature heat pump	no
Equipped with a supplementary heater	no
Heat pump combination heater	no
Temperature application	middle (55 °C - 47 °C)
Climate conditions	average

Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated heat output at Tdesignh	Prated	216.7	kW	Seasonal space heating energy efficiency	ηs	210.2	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	Pdh	226.6	kW	Tj = -7 °C	COPd	4.03	-
Tj = +2 °C	Pdh	246.0	kW	Tj = +2 °C	COPd	5.5	-
Tj = +7 °C	Pdh	127.9	kW	Tj = +7 °C	COPd	6.4	-
Tj = +12 °C	Pdh	131.8	kW	Tj = +12 °C	COPd	7.2	-
Tj = bivalent temperature	Pdh	216.7	kW	Tj = bivalent temperature	COPd	3.5	-
Tj = operation limit temperature	Pdh	---	kW	Tj = operation limit temperature	COPd	---	-
Bivalent temperature	Tbiv	-10	°C	Tj = operation limit temperature	TOL	---	°C
Power consumption in modes other than active mode				Heating water operating limit temperature	WTOL	60	°C
Off mode	Poff	0.010	kW				
Thermostat-off mode	Pto	0.010	kW	Supplementary heater			
Standby mode	Psb	0.010	kW	Rated heat output	Psup	35.1	kW
Crankcase heater mode	Pck	0.000	kW	Type of energy input			
Other items				For air-to-water heat pumps: Rated air flow rate, outdoors	-	---	m3/h
Capacity control		multi-stage		For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	22.74 ~ 45.47	m3/h
Sound power level							
indoors	Lwa	71	dB				
outdoors	Lwa	---	dB				
Annual energy consumption	QHE	447702.2	kWh				

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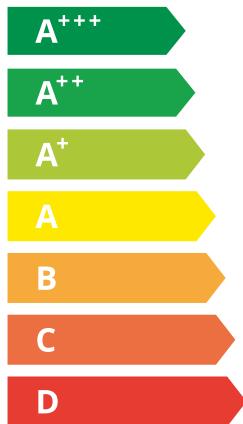
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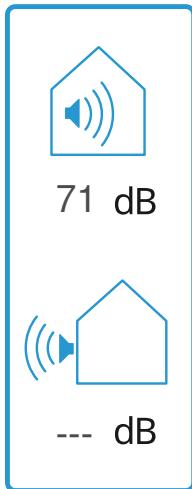
55 °C

35 °C

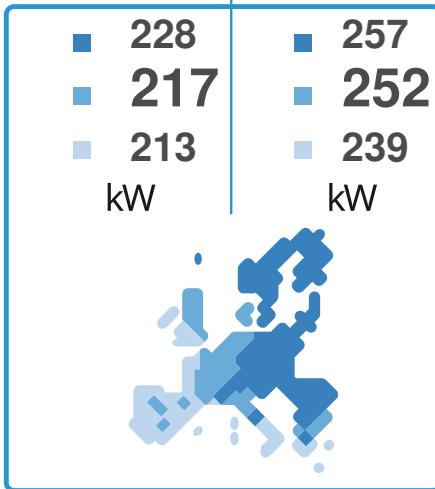


A+++

A+++



2019



811/2013

TWW 245 HD Modul

ErP Data

	55 °C	35 °C
Energy class	A+++	A+++
η	[%]	210.2
P _{rated}	[kW]	217
Q _{HE}	[kWh/y]	447703
SCOP	[-]	5.25
T _{bivalent}	[°C]	-10

CONTROLLER



+ QAA55/75

class **VII**

3.5%

- QAA55/75

class **III**

1.5%

Heating performance data

Version: v202223.006-BW-WW

Source - Brine [0°C] / Low Temperature [35°C]

ZP385KCE-TWD_R410A_2_BWW

Operating conditions		Qh	P	COP
1	B0 / W30-35	185.1	39.6	4.67
2	B0 / W30-35 (MIN)	92.6	19.5	4.74
A	B0 / Wxx-34	186.1	38.8	4.79
B	B0 / Wxx-30	190.2	35.9	5.29
C	B0 / Wxx-27	96.6	16.7	5.78
D	B0 / Wxx-24	98.2	15.8	6.21
E	B0 / Wxx-35	185.1	39.6	4.67
F	B0 / Wxx-35	185.1	39.6	4.67

SCOP DATA EN 14825:2018

Source - Brine [0°C] / Low Temperature [35°C]	
SCOPon	5.40
SCOPnet	5.40
SCOP	5.40
η [%]	215.92
Label	A+++
Qh [kWh]	382417
Pdesignh [kW]	185.1
Tbivalent [°C]	-10

Source - Brine [0°C] / Medium Temperature [55°C]

Operating conditions		Qh	P	COP
1	B0 / W47-55	166.5	60.8	2.74
2	B0 / W47-55 (MIN)	83.3	29.6	2.78
A	B0 / Wxx-52	172.2	55.6	3.23
B	B0 / Wxx-42	185.6	44.0	4.28
C	B0 / Wxx-36	94.3	19.4	4.87
D	B0 / Wxx-30	96.6	17.7	5.45
E	B0 / Wxx-55	166.5	60.8	2.74
F	B0 / Wxx-54	171.3	56.8	3.01

SCOP DATA EN 14825:2018

Source - Brine [0°C] / Medium Temperature [55°C]	
SCOPon	4.12
SCOPnet	4.12
SCOP	4.12
η [%]	164.88
Label	A+++
Qh [kWh]	343989
Pdesignh [kW]	166.5
Tbivalent [°C]	-10

Source - Water [10°C] / Low Temperature [35°C]

Operating conditions		Qh	P	COP
1	W10 / W30-35	251.1	40.8	6.16
2	W10 / W30-35 (MIN)	125.5	20.1	6.24
A	W10 / Wxx-34	252.8	40.0	6.32
B	W10 / Wxx-30	259.6	37.2	6.97
C	W10 / Wxx-27	132.3	17.4	7.59
D	W10 / Wxx-24	134.8	16.6	8.14
E	W10 / Wxx-35	251.1	40.8	6.16
F	W10 / Wxx-35	251.1	40.8	6.16

SCOP DATA EN 14825:2018

Source - Water [10°C] / Low Temperature [35°C]	
SCOPon	7.11
SCOPnet	7.11
SCOP	7.11
η [%]	284.21
Label	A+++
Qh [kWh]	518773
Pdesignh [kW]	251.1
Tbivalent [°C]	-10.00

WAMAK TWW 245 HD Modul

Source - Water [10°C] / Medium Temperature [55°C]

Operating conditions		Qh	P	COP	SCOP DATA EN 14825:2018	
1	W10 / W47-55	216.7	61.2	3.54	Source - Water [10°C] / Medium Temperature [55°C]	
2	W10 / W47-55 (MIN)	108.3	30.2	3.59	SCOPon	5.26
A	W10 / Wxx-52	226.6	56.2	4.03	SCOPnet	5.26
B	W10 / Wxx-42	246.0	44.9	5.48	SCOP	5.25
C	W10 / Wxx-36	127.9	20.0	6.41	η [%]	210.19
D	W10 / Wxx-30	131.8	18.4	7.16	Label	A+++
E	W10 / Wxx-55	216.7	61.2	3.54	Qh [kWh]	447702
F	W10 / Wxx-55	216.7	61.2	3.54	Pdesignh [kW]	216.7
					Tbivalent [°C]	-10.00

Low temperature cooling W 12 / 7°C

Operating conditions		Qc	P	EER	SEER DATA EN 14825:2018 [W 12 / 7°C]	
A	W30-35 / W12-7	137.4	42.0	3.27	SEERon	4.06
B	W26-xx / W12-7	144.2	38.8	3.72	SEER	4.06
C	W22-xx / W12-7	150.8	35.8	4.21	Qc [kWh]	77100
D	W18-xx / W12-7	154.0	34.5	4.47	η [%]	162.21

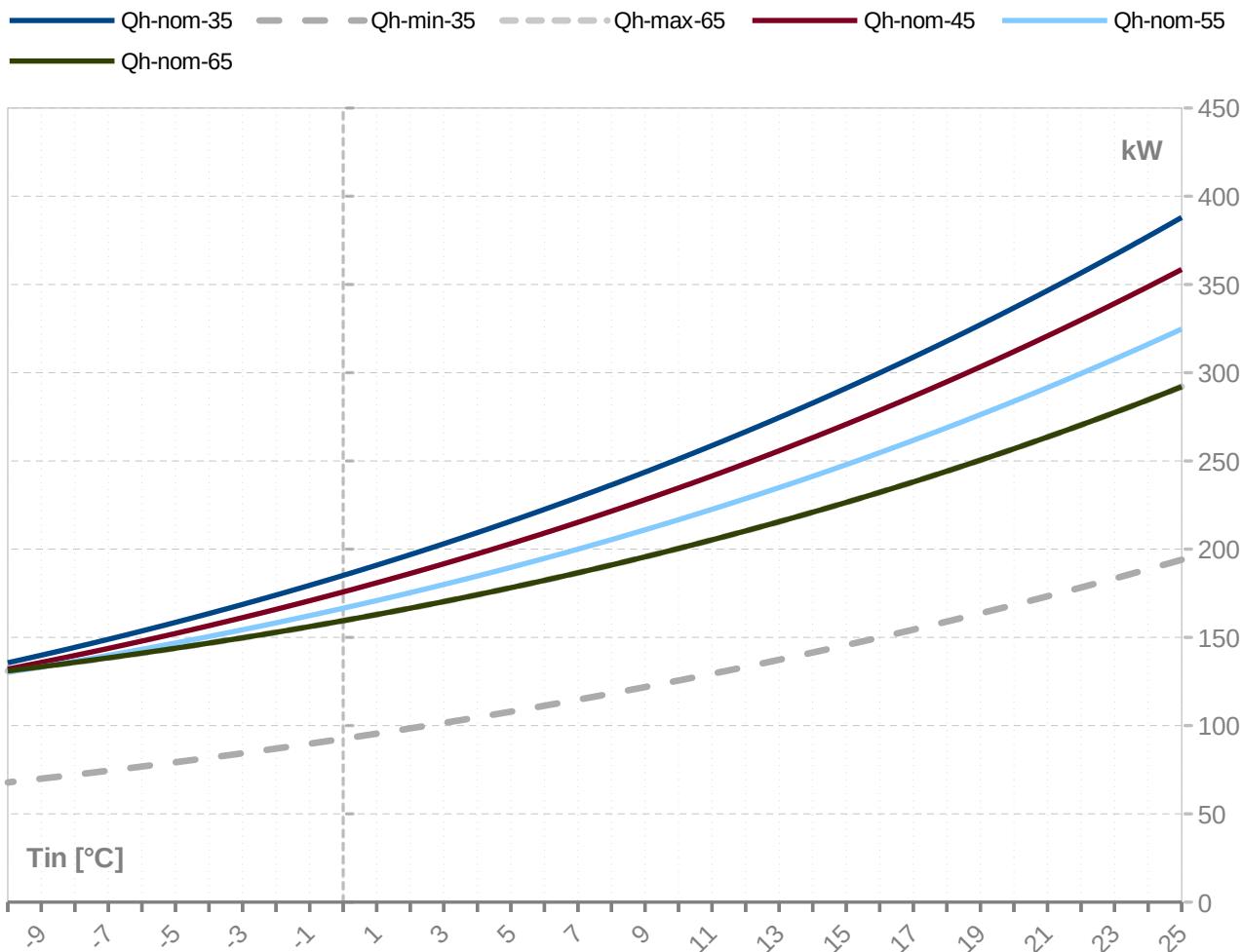
Radiant cooling W 23 / 18°C

Operating conditions		Qc	P	EER	SEER DATA EN 14825:2018 [W 23 / 18°C]	
A	W50-xx / W23-18	145.3	65.1	2.23	SEERon	5.84
B	W40-xx / W23-18	173.1	52.0	3.33	SEER	5.84
C	W30-35 / W23-18	198.6	42.0	4.72	Qc [kWh]	77100
D	W26-xx / W23-18	208.1	38.8	5.37	η [%]	233.68

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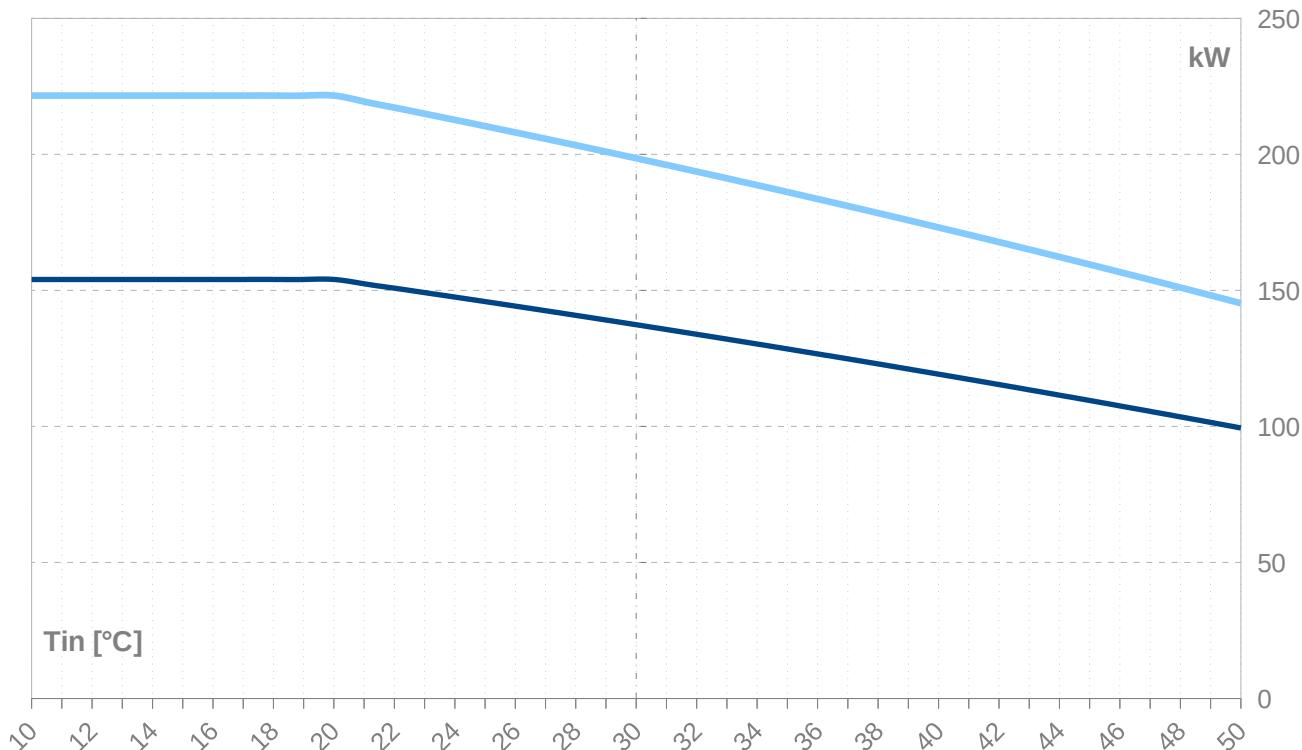
Performance lines - heating

ZP385KCE-TWD_R410A_2_BWW



Performance lines - cooling

Qc-nom-12-7 Qc-nom-23-18



Th -OU	[°C]		35									
Ts -IN	Qh nom	Qh min	Qh max	Pin nom	Pin min	Pin max	COP nom	Qc nom	Qc min	Qc max	I nom	
[°C]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	kW / kW	[kW]	[kW]	[kW]	[A]	
25	388.0	194.0	388.0	43.4	21.4	43.4	8.95	347.5	173.7	347.5	76.2	
24	377.2	188.6	377.2	43.2	21.3	43.2	8.74	336.9	168.5	336.9	75.8	
23	366.8	183.4	366.8	43.0	21.2	43.0	8.54	326.6	163.3	326.6	75.5	
22	356.5	178.3	356.5	42.8	21.1	42.8	8.34	316.6	158.3	316.6	75.2	
21	346.5	173.3	346.5	42.6	21.0	42.6	8.14	306.8	153.4	306.8	74.9	
20	336.7	168.4	336.7	42.4	20.9	42.4	7.94	297.2	148.6	297.2	74.6	
19	327.2	163.6	327.2	42.2	20.8	42.2	7.75	287.8	143.9	287.8	74.3	
18	317.9	158.9	317.9	42.0	20.7	42.0	7.56	278.6	139.3	278.6	74.1	
17	308.8	154.4	308.8	41.9	20.6	41.9	7.38	269.7	134.8	269.7	73.8	
16	299.9	150.0	299.9	41.7	20.6	41.7	7.19	261.0	130.5	261.0	73.5	
15	291.3	145.6	291.3	41.5	20.5	41.5	7.01	252.5	126.2	252.5	73.3	
14	282.8	141.4	282.8	41.4	20.4	41.4	6.84	244.2	122.1	244.2	73.1	
13	274.6	137.3	274.6	41.2	20.3	41.2	6.66	236.1	118.0	236.1	72.9	
12	266.5	133.3	266.5	41.1	20.2	41.1	6.49	228.2	114.1	228.2	72.7	
11	258.7	129.4	258.7	40.9	20.2	40.9	6.32	220.5	110.3	220.5	72.5	
10	251.1	125.5	251.1	40.8	20.1	40.8	6.16	213.0	106.5	213.0	72.3	
9	243.7	121.8	243.7	40.6	20.0	40.6	6.00	205.7	102.9	205.7	72.1	
8	236.4	118.2	236.4	40.5	20.0	40.5	5.84	198.6	99.3	198.6	71.9	
7	229.4	114.7	229.4	40.4	19.9	40.4	5.68	191.7	95.8	191.7	71.8	
6	222.5	111.3	222.5	40.2	19.8	40.2	5.53	184.9	92.5	184.9	71.6	
5	215.8	107.9	215.8	40.1	19.8	40.1	5.38	178.4	89.2	178.4	71.5	
4	209.3	104.7	209.3	40.0	19.7	40.0	5.23	172.0	86.0	172.0	71.3	
3	203.0	101.5	203.0	39.9	19.7	39.9	5.09	165.8	82.9	165.8	71.2	
2	196.9	98.4	196.9	39.8	19.6	39.8	4.95	159.7	79.9	159.7	71.1	
1	190.9	95.5	190.9	39.7	19.6	39.7	4.81	153.8	76.9	153.8	71.0	
0	185.1	92.6	185.1	39.6	19.5	39.6	4.67	148.1	74.1	148.1	70.9	
-1	179.5	89.7	179.5	39.5	19.5	39.5	4.54	142.5	71.3	142.5	70.8	
-2	174.0	87.0	174.0	39.5	19.5	39.5	4.41	137.1	68.6	137.1	70.7	
-3	168.7	84.3	168.7	39.4	19.4	39.4	4.28	131.9	65.9	131.9	70.6	
-4	163.5	81.7	163.5	39.3	19.4	39.3	4.16	126.8	63.4	126.8	70.5	
-5	158.5	79.2	158.5	39.3	19.4	39.3	4.04	121.8	60.9	121.8	70.5	
-6	153.6	76.8	153.6	39.2	19.3	39.2	3.92	117.0	58.5	117.0	70.4	
-7	148.9	74.5	148.9	39.2	19.3	39.2	3.80	112.3	56.2	112.3	70.4	
-8	144.3	72.2	144.3	39.2	19.3	39.2	3.69	107.8	53.9	107.8	70.3	
-9	139.9	69.9	139.9	39.1	19.3	39.1	3.58	103.4	51.7	103.4	70.3	
-10	135.6	67.8	135.6	39.1	19.3	39.1	3.47	99.1	49.5	99.1	70.3	
-11	131.4	65.7	131.4	39.1	19.3	39.1	3.36	94.9	47.5	94.9	70.3	
-12	127.4	63.7	127.4	39.1	19.3	39.1	3.26	90.9	45.4	90.9	70.3	
-13	123.5	61.7	123.5	39.1	19.3	39.1	3.16	87.0	43.5	87.0	70.3	
-14	119.7	59.8	119.7	39.1	19.3	39.1	3.06	83.2	41.6	83.2	70.3	
-15	116.0	58.0	116.0	39.1	19.3	39.1	2.97	79.5	39.7	79.5	70.3	

-- attention: operating limits not reflected in performance table

ZP385KCE-TWD_R410A_2_BWW

Th -OU	[°C]	45										
Ts -IN	Qh nom	Qh min	Qh max	Pin nom	Pin min	Pin max	COP nom	Qc nom	Qc min	Qc max	I nom	
[°C]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	kW / kW	[kW]	[kW]	[kW]	[A]	
25	358.5	179.2	358.5	51.6	25.4	51.6	6.95	310.3	155.2	310.3	87.0	
24	348.7	174.4	348.7	51.4	25.3	51.4	6.79	300.8	150.4	300.8	86.7	
23	339.2	169.6	339.2	51.2	25.2	51.2	6.63	291.4	145.7	291.4	86.3	
22	329.9	164.9	329.9	51.0	25.1	51.0	6.47	282.3	141.2	282.3	86.0	
21	320.8	160.4	320.8	50.8	25.0	50.8	6.32	273.4	136.7	273.4	85.7	
20	311.9	156.0	311.9	50.6	24.9	50.6	6.17	264.7	132.4	264.7	85.4	
19	303.3	151.6	303.3	50.4	24.9	50.4	6.02	256.2	128.1	256.2	85.1	
18	294.9	147.4	294.9	50.2	24.8	50.2	5.87	248.0	124.0	248.0	84.8	
17	286.6	143.3	286.6	50.0	24.7	50.0	5.73	239.9	120.0	239.9	84.5	
16	278.6	139.3	278.6	49.9	24.6	49.9	5.59	232.0	116.0	232.0	84.3	
15	270.8	135.4	270.8	49.7	24.5	49.7	5.45	224.4	112.2	224.4	84.1	
14	263.2	131.6	263.2	49.6	24.4	49.6	5.31	216.9	108.5	216.9	83.8	
13	255.8	127.9	255.8	49.4	24.4	49.4	5.18	209.6	104.8	209.6	83.6	
12	248.5	124.3	248.5	49.3	24.3	49.3	5.04	202.5	101.3	202.5	83.4	
11	241.5	120.7	241.5	49.1	24.2	49.1	4.91	195.6	97.8	195.6	83.3	
10	234.6	117.3	234.6	49.0	24.2	49.0	4.79	188.9	94.4	188.9	83.1	
9	228.0	114.0	228.0	48.9	24.1	48.9	4.66	182.3	91.2	182.3	82.9	
8	221.5	110.7	221.5	48.8	24.1	48.8	4.54	175.9	88.0	175.9	82.8	
7	215.2	107.6	215.2	48.7	24.0	48.7	4.42	169.7	84.9	169.7	82.6	
6	209.1	104.5	209.1	48.6	24.0	48.6	4.30	163.7	81.8	163.7	82.5	
5	203.1	101.5	203.1	48.5	23.9	48.5	4.19	157.8	78.9	157.8	82.4	
4	197.3	98.7	197.3	48.4	23.9	48.4	4.07	152.1	76.0	152.1	82.3	
3	191.7	95.8	191.7	48.4	23.9	48.4	3.96	146.5	73.2	146.5	82.2	
2	186.2	93.1	186.2	48.3	23.8	48.3	3.85	141.1	70.5	141.1	82.2	
1	180.9	90.5	180.9	48.3	23.8	48.3	3.75	135.8	67.9	135.8	82.1	
0	175.7	87.9	175.7	48.2	23.8	48.2	3.64	130.7	65.4	130.7	82.1	
-1	170.7	85.4	170.7	48.2	23.8	48.2	3.54	125.7	62.9	125.7	82.0	
-2	165.9	82.9	165.9	48.2	23.8	48.2	3.44	120.9	60.5	120.9	82.0	
-3	161.2	80.6	161.2	48.2	23.7	48.2	3.35	116.2	58.1	116.2	82.0	
-4	156.6	78.3	156.6	48.1	23.7	48.1	3.25	111.7	55.8	111.7	82.0	
-5	152.2	76.1	152.2	48.2	23.7	48.2	3.16	107.2	53.6	107.2	82.0	
-6	147.9	74.0	147.9	48.2	23.8	48.2	3.07	102.9	51.5	102.9	82.0	
-7	143.8	71.9	143.8	48.2	23.8	48.2	2.98	98.8	49.4	98.8	82.0	
-8	139.7	69.9	139.7	48.2	23.8	48.2	2.90	94.7	47.3	94.7	82.0	
-9	135.8	67.9	135.8	48.3	23.8	48.3	2.81	90.8	45.4	90.8	82.1	
-10	132.0	66.0	132.0	48.3	23.8	48.3	2.73	86.9	43.5	86.9	82.2	
-11	128.4	64.2	128.4	48.4	23.9	48.4	2.65	83.2	41.6	83.2	82.2	
-12	124.8	62.4	124.8	48.4	23.9	48.4	2.58	79.6	39.8	79.6	82.3	
-13	121.4	60.7	121.4	48.5	23.9	48.5	2.50	76.1	38.1	76.1	82.4	
-14	118.1	59.1	118.1	48.6	24.0	48.6	2.43	72.7	36.4	72.7	82.5	
-15	114.9	57.4	114.9	48.7	24.0	48.7	2.36	69.4	34.7	69.4	82.6	

-- attention: operating limits not reflected in performance table

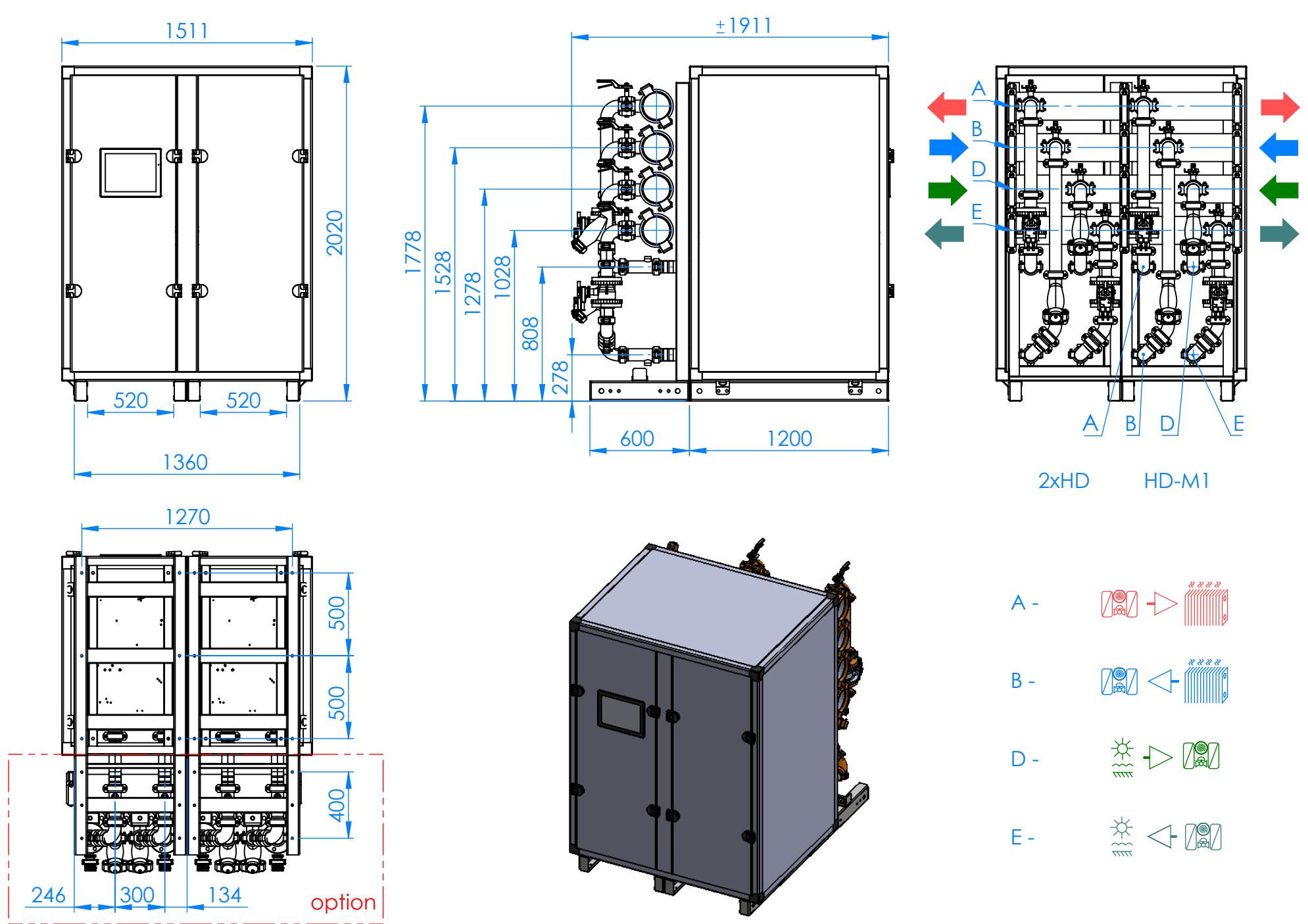
WAMAK TWW 245 HD Modul

Th -OU	[°C]		55								
Ts -IN	Qh nom	Qh min	Qh max	Pin nom	Pin min	Pin max	COP nom	Qc nom	Qc min	Qc max	I nom
[°C]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	kW / kW	[kW]	[kW]	[kW]	[A]
25	324.7	162.4	324.7	63.6	31.4	63.6	5.10	265.3	132.7	265.3	103.7
24	316.1	158.1	316.1	63.4	31.3	63.4	4.99	256.9	128.5	256.9	103.3
23	307.7	153.9	307.7	63.2	31.2	63.2	4.87	248.7	124.4	248.7	102.9
22	299.5	149.8	299.5	63.0	31.0	63.0	4.76	240.7	120.4	240.7	102.6
21	291.6	145.8	291.6	62.8	30.9	62.8	4.65	233.0	116.5	233.0	102.3
20	283.8	141.9	283.8	62.6	30.9	62.6	4.54	225.4	112.7	225.4	102.0
19	276.2	138.1	276.2	62.4	30.8	62.4	4.43	218.0	109.0	218.0	101.7
18	268.9	134.4	268.9	62.2	30.7	62.2	4.32	210.8	105.4	210.8	101.4
17	261.7	130.8	261.7	62.0	30.6	62.0	4.22	203.7	101.9	203.7	101.1
16	254.7	127.3	254.7	61.9	30.5	61.9	4.12	196.9	98.5	196.9	100.9
15	247.9	124.0	247.9	61.7	30.4	61.7	4.02	190.2	95.1	190.2	100.7
14	241.3	120.6	241.3	61.6	30.4	61.6	3.92	183.8	91.9	183.8	100.5
13	234.9	117.4	234.9	61.5	30.3	61.5	3.82	177.5	88.7	177.5	100.3
12	228.6	114.3	228.6	61.4	30.3	61.4	3.73	171.3	85.7	171.3	100.1
11	222.6	111.3	222.6	61.2	30.2	61.2	3.63	165.4	82.7	165.4	100.0
10	216.7	108.3	216.7	61.2	30.2	61.2	3.54	159.5	79.8	159.5	99.8
9	210.9	105.5	210.9	61.1	30.1	61.1	3.45	153.9	77.0	153.9	99.7
8	205.4	102.7	205.4	61.0	30.1	61.0	3.37	148.4	74.2	148.4	99.6
7	200.0	100.0	200.0	60.9	30.0	60.9	3.28	143.1	71.5	143.1	99.5
6	194.7	97.4	194.7	60.9	30.0	60.9	3.20	137.9	68.9	137.9	99.4
5	189.7	94.8	189.7	60.8	30.0	60.8	3.12	132.9	66.4	132.9	99.4
4	184.7	92.4	184.7	60.8	30.0	60.8	3.04	128.0	64.0	128.0	99.3
3	180.0	90.0	180.0	60.8	30.0	60.8	2.96	123.2	61.6	123.2	99.3
2	175.3	87.7	175.3	60.8	30.0	60.8	2.89	118.6	59.3	118.6	99.3
1	170.9	85.4	170.9	60.8	30.0	60.8	2.81	114.1	57.1	114.1	99.3
0	166.5	83.3	166.5	60.8	30.0	60.8	2.74	109.7	54.9	109.7	99.3
-1	162.3	81.2	162.3	60.8	30.0	60.8	2.67	105.5	52.8	105.5	99.3
-2	158.2	79.1	158.2	60.8	30.0	60.8	2.60	101.4	50.7	101.4	99.4
-3	154.3	77.2	154.3	60.9	30.0	60.9	2.53	97.4	48.7	97.4	99.4
-4	150.5	75.2	150.5	61.0	30.1	61.0	2.47	93.6	46.8	93.6	99.5
-5	146.8	73.4	146.8	61.0	30.1	61.0	2.41	89.8	44.9	89.8	99.6
-6	143.2	71.6	143.2	61.1	30.1	61.1	2.34	86.2	43.1	86.2	99.7
-7	139.8	69.9	139.8	61.2	30.2	61.2	2.28	82.6	41.3	82.6	99.8
-8	136.5	68.2	136.5	61.3	30.2	61.3	2.23	79.2	39.6	79.2	99.9
-9	133.3	66.6	133.3	61.4	30.3	61.4	2.17	75.9	37.9	75.9	100.1
-10	130.2	65.1	130.2	61.6	30.4	61.6	2.11	72.7	36.3	72.7	100.2
-11	127.2	63.6	127.2	61.7	30.4	61.7	2.06	69.5	34.8	69.5	100.4
-12	124.3	62.1	124.3	61.9	30.5	61.9	2.01	66.5	33.2	66.5	100.6
-13	121.5	60.7	121.5	62.1	30.6	62.1	1.96	63.5	31.8	63.5	100.8
-14	118.8	59.4	118.8	62.2	30.7	62.2	1.91	60.6	30.3	60.6	101.0
-15	116.1	58.1	116.1	62.4	30.8	62.4	1.86	57.8	28.9	57.8	101.2

-- attention: operating limits not reflected in performance table

LEGEND:

Ts-IN: Temperature renewable source - inlet [°C]
Th-OU: Temperature heating - outlet (flow) [°C]
Tc-OU: Temperature cooling - outlet (flow) [°C]
Qh nom: Heating capacity nominal
Qh min: Heating capacity minimal
Qh max: Heating capacity maximal
Pin nom: Power input at nominal heating capacity
Pin min: Power input at minimal heating capacity
Pin max: Power input at maximal heating capacity
COP nom: coefficient of performance at nominal heating capacity
Qc nom: cooling / heat extraction capacity at nominal heating capacity
Qc min: cooling / heat extraction at minimal heating capacity
Qc max: cooling / heat extraction at maximal heating capacity
I nom: Current at nominal heating capacity
EER: energy efficiency ratio at nominal cooling capacity



WAMAK TWW 245 HD Modul

