



## Heat pump



# TWW 110

# WHR

# WAMAK TWW 110 WHR

## Product description

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Heat pump with two power stages for heating and domestic hot water. One short closed refrigerant circuit with a pair of quiet Scroll compressors and robust stainless steel plate heat exchangers. Through the connection kit, the circulation pumps can be easily and quickly connected while externally controlling their variable speed.

Use for waste heat recovery. The new technology of WHR Scroll compressors with a shifted working range to the high-temperature region with a favorable COP efficiency, which can even reach 4.2 ~ 4.5 at a water outlet temperature of 70 ~ 80 °C and as long as the source temperature is between 30 °C ~ 40 °C.

Thermal energy from various industrial or ancillary processes is used as a primary source. Usually in the temperature range between 20° and 50°C. Depending on the quality and chemical composition of the process medium, the heat is extracted either directly in the heat pump or via a pre-wired heat exchanger with intermediate circuit. The heat pump then raises this temperature with high efficiency 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

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- 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 - (with accessory)
- 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 - (with accessory)
- Solid frame structure

## Basic performance data - WAMAK TWW 110 WHR

Heating - EN 14511		
Heating capacity [kW]	W10 / W35 (max)	60.7 ( 30.4 / 60.7 )
	W10 / W35 (min)	30.4 ( 30.4 / 60.7 )
	W10 / W34	61.1 ( 30.5 / 61.1 )
Electrical power input [kW]	W10 / W35 (max)	10.3 ( 5.1 / 10.3 )
	W10 / W35 (min)	5.1 ( 5.1 / 10.3 )
	W10 / W34	10.1 ( 5.0 / 10.1 )
Heating efficiency faktor [COP]	W10 / W35 (max)	5.89
	W10 / W35 (min)	6.00
	W10 / W34	6.04
Seasonal space heating energy efficiency - SCOP EN 14825		
Average Climate / Low Temperature [35 °C]	SCOP	6.66
	$\eta$ [ % ]	266.5
	Label	A+++
	Qhe [ kWh ]	125406.2
	Pdesignh [ kW ]	60.7
	Tbivalent [ °C ]	-7
Cooling		
Cooling capacity - [kW]	A35 / W23-18	46.0
	A25 / W23-18	51.7
	A35 / W12-7	29.9
	A25 / W12-7	29.9
Seasonal space cooling energy efficiency - SEER EN 14825		
[ W 23 / 18 °C ]	SEER	5.30
	Qce [ kWh ]	17940.0
	$\eta_c$ [ % ]	212.1
Sound EN 12102		
Acoustic power - Lw	dB(A)	62
Acoustic pressure - Lp	1 m dB(A)	54
	5 m dB(A)	40
	10 m dB(A)	34
Mechanical and operational information		
Compressor type (3~ 400/50)	SCROLL / 2 /	On/Off
Refrigerant	R513A (GWP - 631)	16 kg
Operating limit temperatures heating - (min / max ) [ °C ]		45 / 85
Operating limit temperatures source - (min / max ) [ °C ]		-10 / 50
Weight		490 kg

## Main technical data - WAMAK TWW 110 WHR

Enclosure type		VN1100		Heat energy rejection side data		
Basic dimensions	Height [mm]	1270		Operating limit temperatures heating	MAX [°C]	85
	Width [mm]	1100			MIN [°C]	45
	Length [mm]	750		for more see operating limits diagram		
Weight [kg]	490		Condenser	Port size	VIC 2.1/2 "	
Colour	Gray			Type	BPHE	
Enclosure IP Class	IP20			Count	1	
Refrigeration cycle				Material	AISI 316	
Compressor	Type	Scroll		Maximal operating pressure - refrigerant [bar]		32
	Number of stages	2		Maximal operating pressure - Water [bar]		3
	On/Off			Testing pressure [bar]		70
	Power factor Cosφ	0.63		Heat transfer medium		Water
	Winding resistance	1.23 Ohm		Volume flow - Water [m3/h]		7.28 ~ 14.55
Refrigerant		R513A		Internal pressure drop - Water [kPa]		20
	Volme	16 kg		Temperature difference	@ 35°C (nom)	5 K
	GWP	631			@ 55°C	8 K
	Safety class	A1			@ 65°C	10 K
Refrigeration oil type	POE RL32-3MAF		Renewable energy extraction side data			
	Oil volume	2 x 3.25 L		Operating limit temperatures source	MIN [°C]	-10
Maximal pressure - refrigerant [bar]	32		for more see operating limits diagram			
	PED class	2		Evaporator	MAX [°C]	50
EVI - vapour injection with economizer			Port size		VIC 2.1/2 "	
Electrical connection data			Type		BPHE	
Line voltage [#~ V/Hz]	3~ 400/50		Count	1		
Current	nominal [A]	34.44		Material	AISI 316	
	maximal [A]	44.60		Maximal operating pressure - refrigerant [bar]		20
	starting [A]	12.9		Heat transfer medium		Water
Softstart	2 x MCI 25		Maximal operating pressure - Water [bar]		3	
Main safety	C80		Volume flow - Water [m3/h]		6.84 ~ 13.69	
Control System			Internal pressure drop - Water [kPa]		20	
Main controller	SIEMENS	RVS 61		Temperature difference - Water		4 K
Extension module	AVS75.3xx	AVS75.3xx	AVS75.372			
Bus Clip-In			Modbus OCI352			
Online connection	Web server OZW672		ToSyMo			
Superheat controller			SEC61			

\*\*\* with accessory

# WAMAK TWW 110 WHR

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

Model	TWW 110 WHR
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	60.7	kW	Seasonal space heating energy efficiency	$\eta_s$	266.5	%
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	61.1	kW	Tj = -7 °C	COPd	6.04	-
Tj = +2 °C	Pdh	62.6	kW	Tj = +2 °C	COPd	6.6	-
Tj = +7 °C	Pdh	31.8	kW	Tj = +7 °C	COPd	7.3	-
Tj = +12 °C	Pdh	32.3	kW	Tj = +12 °C	COPd	7.8	-
Tj = bivalent temperature	Pdh	60.7	kW	Tj = bivalent temperature	COPd	5.9	-
Tj = operation limit temperature	Pdh	---	kW	Tj = operation limit temperature	COPd	---	-
Bivalent temperature	Tbiv	-7	°C	Tj = operation limit temperature	TOL	---	°C
Power consumption in modes other than active mode				Heating water operating limit temperature	WTOL	85	°C
Off mode	Poff	0.040	kW	Supplementary heater			
Thermostat-off mode	Pto	0.010	kW	Rated heat output	Psup	11.5	kW
Standby mode	Psb	0.010	kW	Type of energy input			electricity
Crankcase heater mode	Pck	0.050	kW				
Other items				For air-to-water heat pumps: Rated air flow rate, outdoors	-	---	m <sup>3</sup> /h
Capacity control		multi-stage		For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-	6.84 ~ 13.69	m <sup>3</sup> /h
Sound power level							
indoors	Lwa	62	dB				
outdoors	Lwa	---	dB				
Annual energy consumption	Q <sub>HE</sub>	125406.2	kWh				

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

Model	TWW 110 WHR
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	53.0	kW	Seasonal space heating energy efficiency	$\eta_s$	201.0	%
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	55.4	kW	Tj = -7 °C	COPd	3.97	-
Tj = +2 °C	Pdh	59.8	kW	Tj = +2 °C	COPd	5.3	-
Tj = +7 °C	Pdh	31.0	kW	Tj = +7 °C	COPd	6.2	-
Tj = +12 °C	Pdh	31.8	kW	Tj = +12 °C	COPd	6.9	-
Tj = bivalent temperature	Pdh	53.0	kW	Tj = bivalent temperature	COPd	3.5	-
Tj = operation limit temperature	Pdh	---	kW	Tj = operation limit temperature	COPd	---	-
Bivalent temperature	Tbiv	-7	°C	Tj = operation limit temperature	TOL	---	°C
Power consumption in modes other than active mode				Heating water operating limit temperature	WTOL	85	°C
Off mode	Poff	0.040	kW	Supplementary heater			
Thermostat-off mode	Pto	0.010	kW	Rated heat output	Psup	11.5	kW
Standby mode	Psb	0.010	kW	Type of energy input	electricity		
Crankcase heater mode	Pck	0.050	kW	For air-to-water heat pumps: Rated air flow rate, outdoors			
Other items				For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger			
Capacity control	multi-stage			-			
Sound power level				-			
indoors	Lwa	62	dB	6.84 ~ 13.69 m3/h			
outdoors	Lwa	---	dB				
Annual energy consumption	Q <sub>HE</sub>	109498.0	kWh				

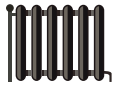
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**WAMAK**

TWW 110 WHR



55 °C

35 °C



**A+++**

**A+++**



62 dB



--- dB

■ 56  
 ■ 53  
 ■ 52  
 kW

■ 62  
 ■ 61  
 ■ 58  
 kW



2019

811/2013

TWW 110 WHR

**ErP Data**

	55 °C	35 °C
Energy class	<b>A+++</b>	<b>A+++</b>
$\eta$ [%]	201.0	266.5
$P_{rated}$ [kW]	53	61
$Q_{HE}$ [kWh/y]	109498	125407
SCOP [-]	5.03	6.66
$T_{bivalent}$ [°C]	-7	-7

CONTROLLER



+ QAA55/75  
 - QAA55/75

class VII  
 class III

3.5% ↓  
 1.5% ↓

Heating performance data		Heat recovery		
Operating conditions		Qh	P	COP
W45 / W80		113.2	25.3	4.47
W30 / W70		84.1	20.8	4.04
W25 / W60		93.6	17.2	5.45

**Normative data: water - water application**

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

Operating conditions		Qh	P	COP
1	W10 / W30-35	60.7	10.3	5.89
2	W10 / W30-35 ( MIN )	30.4	5.1	6.00
A	W10 / Wxx-34	61.1	10.1	6.04
B	W10 / Wxx-30	62.6	9.4	6.65
C	W10 / Wxx-27	31.8	4.4	7.26
D	W10 / Wxx-24	32.3	4.1	7.79
E	W10 / Wxx-35	60.7	10.3	5.89
F	W10 / Wxx-35	60.7	10.3	5.89

SCOP DATA EN 14825:2018	
<b>Source - Water [10°C] / Low Temperature [35°C]</b>	
SCOPon	6.79
SCOPnet	6.79
SCOP	6.66
η [ % ]	266.54
Label	A+++
Qh [ kWh ]	125406
Pdesignh [ kW ]	60.7
Tbivalent [ °C ]	-7.00

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

Operating conditions		Qh	P	COP
1	W10 / W47-55	53.0	15.1	3.50
2	W10 / W47-55 ( MIN )	26.5	7.4	3.56
A	W10 / Wxx-52	55.4	14.0	3.97
B	W10 / Wxx-42	59.8	11.3	5.29
C	W10 / Wxx-36	31.0	5.0	6.16
D	W10 / Wxx-30	31.8	4.6	6.87
E	W10 / Wxx-55	53.0	15.1	3.50
F	W10 / Wxx-55	53.0	15.1	3.50

SCOP DATA EN 14825:2018	
<b>Source - Water [10°C] / Medium Temperature [55°C]</b>	
SCOPon	5.11
SCOPnet	5.11
SCOP	5.03
η [ % ]	201.01
Label	A+++
Qh [ kWh ]	109498
Pdesignh [ kW ]	53.0
Tbivalent [ °C ]	-7.00



**Low temperature cooling W 12 / 7°C**

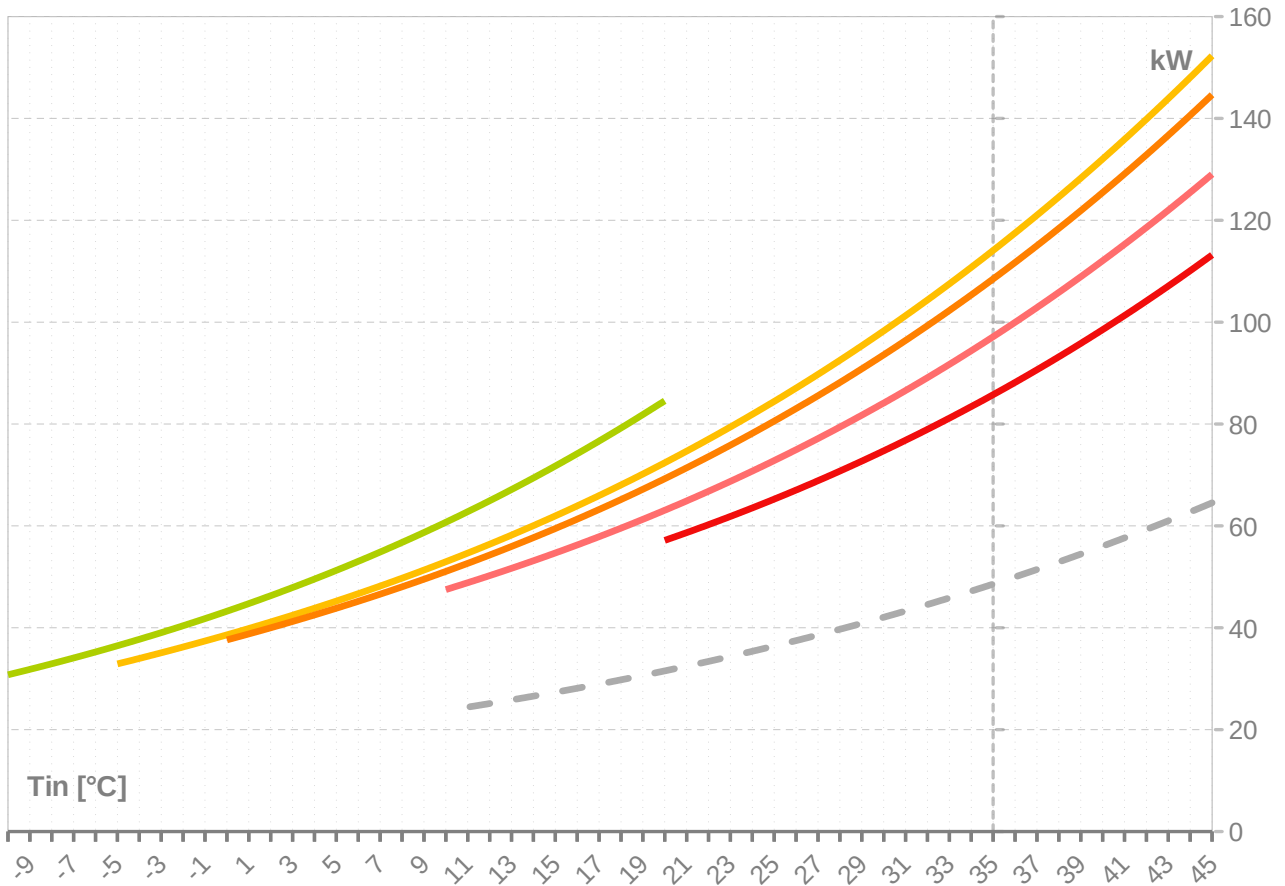
Operating conditions					SEER DATA EN 14825:2018 [ W 12 / 7°C ]	
		Qc	P	EER		
A	W30-35 / W12-7	32.2	10.9	2.95	SEERon	3.64
B	W26-xx / W12-7	33.9	10.1	3.35	SEER	3.56
C	W22-xx / W12-7	35.5	9.4	3.77	Qc [ kWh ]	17940
D	W18-xx / W12-7	36.3	9.1	4.00	η [ % ]	142.41

**Radiant cooling W 23 / 18°C**

Operating conditions					SEER DATA EN 14825:2018 [ W 23 / 18°C ]	
		Qc	P	EER		
A	W50-xx / W23-18	36.2	16.4	2.21	SEERon	5.48
B	W40-xx / W23-18	42.9	13.3	3.23	SEER	5.30
C	W30-35 / W23-18	48.9	10.9	4.49	Qc [ kWh ]	17940
D	W26-xx / W23-18	51.2	10.1	5.06	η [ % ]	212.07

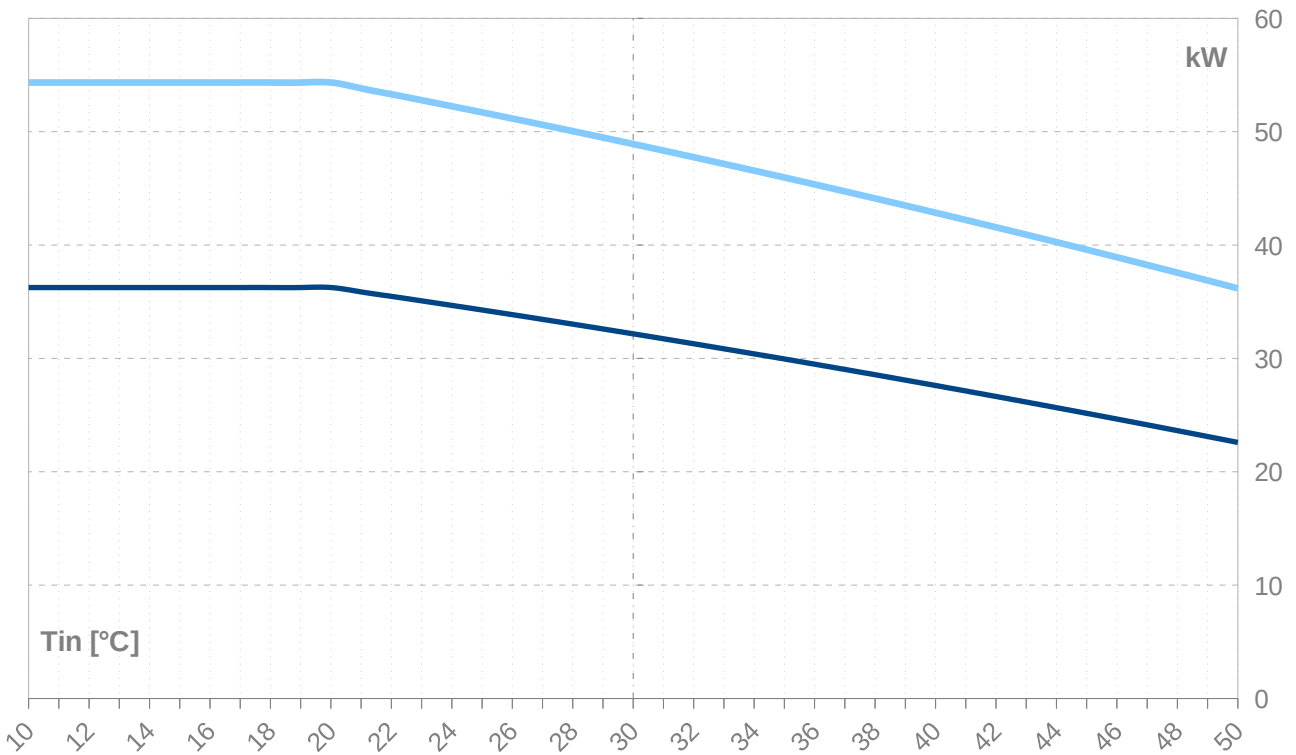
Performance lines - heating

- Qh-nom-35
- Qh-nom-55
- Qh-nom-60
- Qh-nom-70
- Qh-nom-80
- - - Qh-min-70



Performance lines - cooling

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



Th -OU		55										
Ts -IN [°C]	Qh nom [kW]	Qh min [kW]	Qh max [kW]	Pin nom [kW]	Pin min [kW]	Pin max [kW]	COP nom kW / kW	Qc nom [kW]	Qc min [kW]	Qc max [kW]	I nom [A]	
45	<b>152.3</b>	76.1	152.3	<b>16.3</b>	8.0	16.3	<b>9.32</b>	137.1	68.6	137.1	29.3	
44	<b>148.0</b>	74.0	148.0	<b>16.3</b>	8.0	16.3	<b>9.09</b>	132.9	66.5	132.9	29.3	
43	<b>143.9</b>	71.9	143.9	<b>16.2</b>	8.0	16.2	<b>8.86</b>	128.8	64.4	128.8	29.2	
42	<b>139.8</b>	69.9	139.8	<b>16.2</b>	8.0	16.2	<b>8.64</b>	124.8	62.4	124.8	29.1	
41	<b>135.9</b>	67.9	135.9	<b>16.1</b>	7.9	16.1	<b>8.42</b>	120.9	60.5	120.9	29.1	
40	<b>132.0</b>	66.0	132.0	<b>16.1</b>	7.9	16.1	<b>8.21</b>	117.1	58.6	117.1	29.0	
39	<b>128.3</b>	64.1	128.3	<b>16.0</b>	7.9	16.0	<b>8.00</b>	113.4	56.7	113.4	29.0	
38	<b>124.6</b>	62.3	124.6	<b>16.0</b>	7.9	16.0	<b>7.79</b>	109.8	54.9	109.8	28.9	
37	<b>121.0</b>	60.5	121.0	<b>15.9</b>	7.8	15.9	<b>7.59</b>	106.2	53.1	106.2	28.8	
36	<b>117.5</b>	58.7	117.5	<b>15.9</b>	7.8	15.9	<b>7.39</b>	102.8	51.4	102.8	28.8	
35	<b>114.1</b>	57.0	114.1	<b>15.9</b>	7.8	15.9	<b>7.20</b>	99.4	49.7	99.4	28.7	
34	<b>110.8</b>	55.4	110.8	<b>15.8</b>	7.8	15.8	<b>7.00</b>	96.1	48.0	96.1	28.7	
33	<b>107.5</b>	53.8	107.5	<b>15.8</b>	7.8	15.8	<b>6.82</b>	92.9	46.4	92.9	28.6	
32	<b>104.4</b>	52.2	104.4	<b>15.7</b>	7.7	15.7	<b>6.63</b>	89.8	44.9	89.8	28.6	
31	<b>101.3</b>	50.6	101.3	<b>15.7</b>	7.7	15.7	<b>6.45</b>	86.7	43.4	86.7	28.5	
30	<b>98.3</b>	49.1	98.3	<b>15.7</b>	7.7	15.7	<b>6.28</b>	83.8	41.9	83.8	28.5	
29	<b>95.4</b>	47.7	95.4	<b>15.6</b>	7.7	15.6	<b>6.11</b>	80.9	40.4	80.9	28.5	
28	<b>92.5</b>	46.3	92.5	<b>15.6</b>	7.7	15.6	<b>5.94</b>	78.1	39.0	78.1	28.4	
27	<b>89.8</b>	44.9	89.8	<b>15.5</b>	7.6	15.5	<b>5.77</b>	75.3	37.7	75.3	28.4	
26	<b>87.1</b>	43.5	87.1	<b>15.5</b>	7.6	15.5	<b>5.61</b>	72.7	36.3	72.7	28.3	
25	<b>84.4</b>	42.2	84.4	<b>15.5</b>	7.6	15.5	<b>5.45</b>	70.1	35.0	70.1	28.3	
24	<b>81.9</b>	40.9	81.9	<b>15.4</b>	7.6	15.4	<b>5.30</b>	67.6	33.8	67.6	28.3	
23	<b>79.4</b>	39.7	79.4	<b>15.4</b>	7.6	15.4	<b>5.15</b>	65.1	32.6	65.1	28.2	
22	<b>77.0</b>	38.5	77.0	<b>15.4</b>	7.6	15.4	<b>5.00</b>	62.7	31.4	62.7	28.2	
21	<b>74.7</b>	37.3	74.7	<b>15.4</b>	7.6	15.4	<b>4.86</b>	60.4	30.2	60.4	28.2	
20	<b>72.4</b>	36.2	72.4	<b>15.3</b>	7.5	15.3	<b>4.72</b>	58.2	29.1	58.2	28.1	
19	<b>70.2</b>	35.1	70.2	<b>15.3</b>	7.5	15.3	<b>4.58</b>	56.0	28.0	56.0	28.1	
18	<b>68.0</b>	34.0	68.0	<b>15.3</b>	7.5	15.3	<b>4.45</b>	53.9	26.9	53.9	28.1	
17	<b>65.9</b>	33.0	65.9	<b>15.3</b>	7.5	15.3	<b>4.32</b>	51.8	25.9	51.8	28.0	
16	<b>63.9</b>	32.0	63.9	<b>15.2</b>	7.5	15.2	<b>4.19</b>	49.8	24.9	49.8	28.0	
15	<b>62.0</b>	31.0	62.0	<b>15.2</b>	7.5	15.2	<b>4.07</b>	47.8	23.9	47.8	28.0	
14	<b>60.0</b>	30.0	60.0	<b>15.2</b>	7.5	15.2	<b>3.95</b>	45.9	23.0	45.9	28.0	
13	<b>58.2</b>	29.1	58.2	<b>15.2</b>	7.5	15.2	<b>3.83</b>	44.1	22.1	44.1	27.9	
12	<b>56.4</b>	28.2	56.4	<b>15.2</b>	7.5	15.2	<b>3.72</b>	42.3	21.2	42.3	27.9	
11	<b>54.7</b>	27.3	54.7	<b>15.2</b>	7.4	15.2	<b>3.61</b>	40.6	20.3	40.6	27.9	
10	<b>53.0</b>	26.5	53.0	<b>15.1</b>	7.4	15.1	<b>3.50</b>	38.9	19.5	38.9	27.9	
9	<b>51.3</b>	25.7	51.3	<b>15.1</b>	7.4	15.1	<b>3.39</b>	37.3	18.6	37.3	27.9	
8	<b>49.7</b>	24.9	49.7	<b>15.1</b>	7.4	15.1	<b>3.29</b>	35.7	17.9	35.7	27.9	
7	<b>48.2</b>	24.1	48.2	<b>15.1</b>	7.4	15.1	<b>3.19</b>	34.2	17.1	34.2	27.9	
6	<b>46.7</b>	23.3	46.7	<b>15.1</b>	7.4	15.1	<b>3.09</b>	32.7	16.3	32.7	27.8	
5	<b>45.2</b>	22.6	45.2	<b>15.1</b>	7.4	15.1	<b>3.00</b>	31.3	15.6	31.3	27.8	
4	<b>43.8</b>	21.9	43.8	<b>15.1</b>	7.4	15.1	<b>2.91</b>	29.9	14.9	29.9	27.8	
3	<b>42.5</b>	21.2	42.5	<b>15.1</b>	7.4	15.1	<b>2.82</b>	28.5	14.2	28.5	27.8	
2	<b>41.1</b>	20.6	41.1	<b>15.1</b>	7.4	15.1	<b>2.73</b>	27.2	13.6	27.2	27.8	
1	<b>39.9</b>	19.9	39.9	<b>15.1</b>	7.4	15.1	<b>2.65</b>	25.9	12.9	25.9	27.8	
0	<b>38.6</b>	19.3	38.6	<b>15.1</b>	7.4	15.1	<b>2.57</b>	24.6	12.3	24.6	27.8	
-1	<b>37.4</b>	18.7	37.4	<b>15.0</b>	7.4	15.0	<b>2.48</b>	23.4	11.7	23.4	27.8	
-2	<b>36.2</b>	18.1	36.2	<b>15.0</b>	7.4	15.0	<b>2.41</b>	22.3	11.1	22.3	27.8	
-3	<b>35.1</b>	17.5	35.1	<b>15.0</b>	7.4	15.0	<b>2.33</b>	21.1	10.6	21.1	27.8	
-4	<b>34.0</b>	17.0	34.0	<b>15.1</b>	7.4	15.1	<b>2.26</b>	20.0	10.0	20.0	27.8	
-5	<b>32.9</b>	16.4	32.9	<b>15.1</b>	7.4	15.1	<b>2.19</b>	18.9	9.5	18.9	27.8	

-- attention: operating limits not reflected in performance table

ZR144KRE-TFD\_R513A\_2\_WHR

Th -OU	60										
[°C]	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]
45	<b>144.6</b>	72.3	144.6	<b>17.7</b>	8.7	17.7	<b>8.16</b>	128.2	64.1	128.2	31.0
44	<b>140.6</b>	70.3	140.6	<b>17.7</b>	8.7	17.7	<b>7.95</b>	124.2	62.1	124.2	31.0
43	<b>136.7</b>	68.3	136.7	<b>17.6</b>	8.7	17.6	<b>7.75</b>	120.3	60.2	120.3	30.9
42	<b>132.8</b>	66.4	132.8	<b>17.6</b>	8.6	17.6	<b>7.55</b>	116.5	58.3	116.5	30.8
41	<b>129.1</b>	64.6	129.1	<b>17.6</b>	8.6	17.6	<b>7.36</b>	112.8	56.4	112.8	30.8
40	<b>125.5</b>	62.7	125.5	<b>17.5</b>	8.6	17.5	<b>7.16</b>	109.2	54.6	109.2	30.7
39	<b>121.9</b>	60.9	121.9	<b>17.5</b>	8.6	17.5	<b>6.98</b>	105.7	52.8	105.7	30.7
38	<b>118.4</b>	59.2	118.4	<b>17.4</b>	8.6	17.4	<b>6.79</b>	102.2	51.1	102.2	30.7
37	<b>115.0</b>	57.5	115.0	<b>17.4</b>	8.6	17.4	<b>6.61</b>	98.9	49.4	98.9	30.6
36	<b>111.7</b>	55.9	111.7	<b>17.4</b>	8.5	17.4	<b>6.44</b>	95.6	47.8	95.6	30.6
35	<b>108.5</b>	54.2	108.5	<b>17.3</b>	8.5	17.3	<b>6.26</b>	92.4	46.2	92.4	30.5
34	<b>105.4</b>	52.7	105.4	<b>17.3</b>	8.5	17.3	<b>6.09</b>	89.3	44.7	89.3	30.5
33	<b>102.3</b>	51.1	102.3	<b>17.3</b>	8.5	17.3	<b>5.93</b>	86.3	43.1	86.3	30.4
32	<b>99.3</b>	49.7	99.3	<b>17.2</b>	8.5	17.2	<b>5.77</b>	83.3	41.7	83.3	30.4
31	<b>96.4</b>	48.2	96.4	<b>17.2</b>	8.5	17.2	<b>5.61</b>	80.5	40.2	80.5	30.4
30	<b>93.6</b>	46.8	93.6	<b>17.2</b>	8.4	17.2	<b>5.45</b>	77.7	38.8	77.7	30.3
29	<b>90.8</b>	45.4	90.8	<b>17.1</b>	8.4	17.1	<b>5.30</b>	74.9	37.5	74.9	30.3
28	<b>88.2</b>	44.1	88.2	<b>17.1</b>	8.4	17.1	<b>5.15</b>	72.3	36.1	72.3	30.3
27	<b>85.6</b>	42.8	85.6	<b>17.1</b>	8.4	17.1	<b>5.01</b>	69.7	34.9	69.7	30.2
26	<b>83.0</b>	41.5	83.0	<b>17.1</b>	8.4	17.1	<b>4.87</b>	67.2	33.6	67.2	30.2
25	<b>80.6</b>	40.3	80.6	<b>17.0</b>	8.4	17.0	<b>4.73</b>	64.8	32.4	64.8	30.2
24	<b>78.2</b>	39.1	78.2	<b>17.0</b>	8.4	17.0	<b>4.60</b>	62.4	31.2	62.4	30.1
23	<b>75.8</b>	37.9	75.8	<b>17.0</b>	8.3	17.0	<b>4.47</b>	60.1	30.0	60.1	30.1
22	<b>73.6</b>	36.8	73.6	<b>17.0</b>	8.3	17.0	<b>4.34</b>	57.9	28.9	57.9	30.1
21	<b>71.4</b>	35.7	71.4	<b>16.9</b>	8.3	16.9	<b>4.21</b>	55.7	27.8	55.7	30.1
20	<b>69.3</b>	34.6	69.3	<b>16.9</b>	8.3	16.9	<b>4.09</b>	53.6	26.8	53.6	30.0
19	<b>67.2</b>	33.6	67.2	<b>16.9</b>	8.3	16.9	<b>3.97</b>	51.5	25.7	51.5	30.0
18	<b>65.2</b>	32.6	65.2	<b>16.9</b>	8.3	16.9	<b>3.86</b>	49.5	24.8	49.5	30.0
17	<b>63.2</b>	31.6	63.2	<b>16.9</b>	8.3	16.9	<b>3.75</b>	47.6	23.8	47.6	30.0
16	<b>61.3</b>	30.7	61.3	<b>16.9</b>	8.3	16.9	<b>3.64</b>	45.7	22.8	45.7	30.0
15	<b>59.5</b>	29.7	59.5	<b>16.8</b>	8.3	16.8	<b>3.53</b>	43.9	21.9	43.9	30.0
14	<b>57.7</b>	28.8	57.7	<b>16.8</b>	8.3	16.8	<b>3.43</b>	42.1	21.0	42.1	29.9
13	<b>56.0</b>	28.0	56.0	<b>16.8</b>	8.3	16.8	<b>3.33</b>	40.4	20.2	40.4	29.9
12	<b>54.3</b>	27.1	54.3	<b>16.8</b>	8.3	16.8	<b>3.23</b>	38.7	19.3	38.7	29.9
11	<b>52.6</b>	26.3	52.6	<b>16.8</b>	8.3	16.8	<b>3.13</b>	37.1	18.5	37.1	29.9
10	<b>51.1</b>	25.5	51.1	<b>16.8</b>	8.3	16.8	<b>3.04</b>	35.5	17.7	35.5	29.9
9	<b>49.5</b>	24.8	49.5	<b>16.8</b>	8.3	16.8	<b>2.95</b>	34.0	17.0	34.0	29.9
8	<b>48.0</b>	24.0	48.0	<b>16.8</b>	8.2	16.8	<b>2.86</b>	32.5	16.2	32.5	29.9
7	<b>46.6</b>	23.3	46.6	<b>16.8</b>	8.2	16.8	<b>2.78</b>	31.0	15.5	31.0	29.9
6	<b>45.2</b>	22.6	45.2	<b>16.8</b>	8.2	16.8	<b>2.69</b>	29.6	14.8	29.6	29.9
5	<b>43.8</b>	21.9	43.8	<b>16.8</b>	8.2	16.8	<b>2.61</b>	28.3	14.1	28.3	29.9
4	<b>42.5</b>	21.3	42.5	<b>16.8</b>	8.2	16.8	<b>2.54</b>	27.0	13.5	27.0	29.9
3	<b>41.2</b>	20.6	41.2	<b>16.8</b>	8.2	16.8	<b>2.46</b>	25.7	12.8	25.7	29.9
2	<b>40.0</b>	20.0	40.0	<b>16.8</b>	8.2	16.8	<b>2.39</b>	24.4	12.2	24.4	29.9
1	<b>38.8</b>	19.4	38.8	<b>16.8</b>	8.2	16.8	<b>2.31</b>	23.2	11.6	23.2	29.9
0	<b>37.6</b>	18.8	37.6	<b>16.8</b>	8.2	16.8	<b>2.24</b>	22.1	11.0	22.1	29.9
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-- attention: operating limits not reflected in performance table

**WAMAK TWW 110 WHR**

Th -OU	[°C]	70									
		Ts -IN [°C]	Qh nom [kW]	Qh min [kW]	Qh max [kW]	Pin nom [kW]	Pin min [kW]	Pin max [kW]	COP nom kW / kW	Qc nom [kW]	Qc min [kW]
45	<b>129.0</b>	64.5	129.0	<b>21.0</b>	10.3	21.0	<b>6.13</b>	109.5	54.8	109.5	35.3
44	<b>125.5</b>	62.7	125.5	<b>21.0</b>	10.3	21.0	<b>5.97</b>	106.0	53.0	106.0	35.2
43	<b>122.0</b>	61.0	122.0	<b>21.0</b>	10.3	21.0	<b>5.81</b>	102.5	51.3	102.5	35.2
42	<b>118.6</b>	59.3	118.6	<b>21.0</b>	10.3	21.0	<b>5.65</b>	99.1	49.6	99.1	35.2
41	<b>115.3</b>	57.6	115.3	<b>21.0</b>	10.3	21.0	<b>5.50</b>	95.8	47.9	95.8	35.2
40	<b>112.1</b>	56.0	112.1	<b>20.9</b>	10.3	20.9	<b>5.35</b>	92.6	46.3	92.6	35.1
39	<b>108.9</b>	54.5	108.9	<b>20.9</b>	10.3	20.9	<b>5.20</b>	89.5	44.7	89.5	35.1
38	<b>105.9</b>	52.9	105.9	<b>20.9</b>	10.3	20.9	<b>5.06</b>	86.4	43.2	86.4	35.1
37	<b>102.9</b>	51.4	102.9	<b>20.9</b>	10.3	20.9	<b>4.92</b>	83.5	41.7	83.5	35.1
36	<b>100.0</b>	50.0	100.0	<b>20.9</b>	10.3	20.9	<b>4.79</b>	80.6	40.3	80.6	35.1
35	<b>97.1</b>	48.6	97.1	<b>20.9</b>	10.3	20.9	<b>4.65</b>	77.8	38.9	77.8	35.0
34	<b>94.4</b>	47.2	94.4	<b>20.9</b>	10.3	20.9	<b>4.52</b>	75.0	37.5	75.0	35.0
33	<b>91.7</b>	45.9	91.7	<b>20.9</b>	10.2	20.9	<b>4.40</b>	72.4	36.2	72.4	35.0
32	<b>89.1</b>	44.6	89.1	<b>20.8</b>	10.2	20.8	<b>4.28</b>	69.8	34.9	69.8	35.0
31	<b>86.6</b>	43.3	86.6	<b>20.8</b>	10.2	20.8	<b>4.16</b>	67.3	33.6	67.3	35.0
30	<b>84.1</b>	42.1	84.1	<b>20.8</b>	10.2	20.8	<b>4.04</b>	64.8	32.4	64.8	35.0
29	<b>81.7</b>	40.9	81.7	<b>20.8</b>	10.2	20.8	<b>3.93</b>	62.4	31.2	62.4	35.0
28	<b>79.4</b>	39.7	79.4	<b>20.8</b>	10.2	20.8	<b>3.82</b>	60.1	30.1	60.1	35.0
27	<b>77.1</b>	38.6	77.1	<b>20.8</b>	10.2	20.8	<b>3.71</b>	57.9	28.9	57.9	34.9
26	<b>74.9</b>	37.5	74.9	<b>20.8</b>	10.2	20.8	<b>3.60</b>	55.7	27.8	55.7	34.9
25	<b>72.8</b>	36.4	72.8	<b>20.8</b>	10.2	20.8	<b>3.50</b>	53.5	26.8	53.5	34.9
24	<b>70.7</b>	35.4	70.7	<b>20.8</b>	10.2	20.8	<b>3.40</b>	51.5	25.7	51.5	34.9
23	<b>68.7</b>	34.4	68.7	<b>20.8</b>	10.2	20.8	<b>3.31</b>	49.5	24.7	49.5	34.9
22	<b>66.8</b>	33.4	66.8	<b>20.8</b>	10.2	20.8	<b>3.21</b>	47.5	23.8	47.5	34.9
21	<b>64.9</b>	32.4	64.9	<b>20.8</b>	10.2	20.8	<b>3.12</b>	45.6	22.8	45.6	34.9
20	<b>63.1</b>	31.5	63.1	<b>20.8</b>	10.2	20.8	<b>3.03</b>	43.8	21.9	43.8	34.9
19	<b>61.3</b>	30.6	61.3	<b>20.8</b>	10.2	20.8	<b>2.95</b>	42.0	21.0	42.0	34.9
18	<b>59.6</b>	29.8	59.6	<b>20.8</b>	10.2	20.8	<b>2.87</b>	40.3	20.1	40.3	34.9
17	<b>57.9</b>	28.9	57.9	<b>20.8</b>	10.2	20.8	<b>2.78</b>	38.6	19.3	38.6	34.9
16	<b>56.3</b>	28.1	56.3	<b>20.8</b>	10.2	20.8	<b>2.71</b>	37.0	18.5	37.0	35.0
15	<b>54.7</b>	27.3	54.7	<b>20.8</b>	10.2	20.8	<b>2.63</b>	35.4	17.7	35.4	35.0
14	<b>53.2</b>	26.6	53.2	<b>20.8</b>	10.2	20.8	<b>2.55</b>	33.9	16.9	33.9	35.0
13	<b>51.7</b>	25.8	51.7	<b>20.8</b>	10.2	20.8	<b>2.48</b>	32.4	16.2	32.4	35.0
12	<b>50.2</b>	25.1	50.2	<b>20.8</b>	10.2	20.8	<b>2.41</b>	30.9	15.5	30.9	35.0
11	<b>48.8</b>	24.4	48.8	<b>20.8</b>	10.2	20.8	<b>2.35</b>	29.5	14.8	29.5	35.0
10	<b>47.5</b>	23.7	47.5	<b>20.8</b>	10.2	20.8	<b>2.28</b>	28.2	14.1	28.2	35.0
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-- attention: operating limits not reflected in performance table

Th -OU	80										
Th -IN [°C]	Qh nom [kW]	Qh min [kW]	Qh max [kW]	Pin nom [kW]	Pin min [kW]	Pin max [kW]	COP nom kW / kW	Qc nom [kW]	Qc min [kW]	Qc max [kW]	I nom [A]
45	113.2	56.6	113.2	25.3	12.4	25.3	4.47	89.7	44.9	89.7	41.0
44	110.1	55.1	110.1	25.3	12.4	25.3	4.35	86.6	43.3	86.6	41.0
43	107.1	53.5	107.1	25.3	12.4	25.3	4.23	83.6	41.8	83.6	41.0
42	104.2	52.1	104.2	25.3	12.5	25.3	4.11	80.7	40.3	80.7	41.0
41	101.3	50.7	101.3	25.3	12.5	25.3	4.00	77.8	38.9	77.8	41.0
40	98.5	49.3	98.5	25.4	12.5	25.4	3.89	75.0	37.5	75.0	41.0
39	95.8	47.9	95.8	25.4	12.5	25.4	3.78	72.3	36.2	72.3	41.1
38	93.2	46.6	93.2	25.4	12.5	25.4	3.67	69.7	34.8	69.7	41.1
37	90.6	45.3	90.6	25.4	12.5	25.4	3.57	67.1	33.6	67.1	41.1
36	88.2	44.1	88.2	25.4	12.5	25.4	3.47	64.6	32.3	64.6	41.1
35	85.8	42.9	85.8	25.4	12.5	25.4	3.37	62.2	31.1	62.2	41.1
34	83.4	41.7	83.4	25.4	12.5	25.4	3.28	59.8	29.9	59.8	41.1
33	81.1	40.6	81.1	25.4	12.5	25.4	3.19	57.5	28.8	57.5	41.2
32	78.9	39.5	78.9	25.5	12.5	25.5	3.10	55.3	27.7	55.3	41.2
31	76.8	38.4	76.8	25.5	12.5	25.5	3.01	53.2	26.6	53.2	41.2
30	74.7	37.4	74.7	25.5	12.5	25.5	2.93	51.1	25.5	51.1	41.2
29	72.7	36.4	72.7	25.5	12.5	25.5	2.85	49.0	24.5	49.0	41.2
28	70.8	35.4	70.8	25.5	12.6	25.5	2.77	47.1	23.5	47.1	41.3
27	68.9	34.4	68.9	25.6	12.6	25.6	2.69	45.2	22.6	45.2	41.3
26	67.0	33.5	67.0	25.6	12.6	25.6	2.62	43.3	21.7	43.3	41.3
25	65.2	32.6	65.2	25.6	12.6	25.6	2.55	41.5	20.8	41.5	41.3
24	63.5	31.8	63.5	25.6	12.6	25.6	2.48	39.8	19.9	39.8	41.4
23	61.9	30.9	61.9	25.6	12.6	25.6	2.41	38.1	19.0	38.1	41.4
22	60.2	30.1	60.2	25.7	12.6	25.7	2.35	36.4	18.2	36.4	41.4
21	58.7	29.3	58.7	25.7	12.6	25.7	2.28	34.8	17.4	34.8	41.5
20	57.2	28.6	57.2	25.7	12.6	25.7	2.22	33.3	16.6	33.3	41.5
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-- attention: operating limits not reflected in performance table

Tc -OU		W 12 / 7 °C										
[°C]	Qc nom	Qc min	Qc max	Pin nom	Pin min	Pin max	EER	Qh nom	Qh min	Qh max	I nom	
[°C]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	kW / kW	[kW]	[kW]	[kW]	[A]	
40	<b>27.6</b>	13.8	27.6	<b>13.3</b>	6.5	13.3	<b>2.08</b>	39.9	20.0	39.9	25.7	
39	<b>28.1</b>	14.0	28.1	<b>13.0</b>	6.4	13.0	<b>2.16</b>	40.1	20.1	40.1	25.4	
38	<b>28.6</b>	14.3	28.6	<b>12.7</b>	6.3	12.7	<b>2.24</b>	40.4	20.2	40.4	25.1	
37	<b>29.0</b>	14.5	29.0	<b>12.5</b>	6.1	12.5	<b>2.32</b>	40.6	20.3	40.6	24.9	
36	<b>29.5</b>	14.7	29.5	<b>12.2</b>	6.0	12.2	<b>2.41</b>	40.8	20.4	40.8	24.6	
35	<b>29.9</b>	15.0	29.9	<b>12.0</b>	5.9	12.0	<b>2.49</b>	41.1	20.5	41.1	24.3	
34	<b>30.4</b>	15.2	30.4	<b>11.8</b>	5.8	11.8	<b>2.58</b>	41.3	20.7	41.3	24.1	
33	<b>30.8</b>	15.4	30.8	<b>11.5</b>	5.7	11.5	<b>2.67</b>	41.6	20.8	41.6	23.8	
32	<b>31.3</b>	15.6	31.3	<b>11.3</b>	5.6	11.3	<b>2.76</b>	41.8	20.9	41.8	23.6	
31	<b>31.7</b>	15.9	31.7	<b>11.1</b>	5.5	11.1	<b>2.86</b>	42.0	21.0	42.0	23.4	
30	<b>32.2</b>	16.1	32.2	<b>10.9</b>	5.4	10.9	<b>2.95</b>	42.3	21.1	42.3	23.2	
29	<b>32.6</b>	16.3	32.6	<b>10.7</b>	5.3	10.7	<b>3.05</b>	42.5	21.3	42.5	23.0	
28	<b>33.0</b>	16.5	33.0	<b>10.5</b>	5.2	10.5	<b>3.15</b>	42.8	21.4	42.8	22.8	
27	<b>33.4</b>	16.7	33.4	<b>10.3</b>	5.1	10.3	<b>3.25</b>	43.0	21.5	43.0	22.6	
26	<b>33.9</b>	16.9	33.9	<b>10.1</b>	5.0	10.1	<b>3.35</b>	43.2	21.6	43.2	22.4	
25	<b>34.3</b>	17.1	34.3	<b>9.9</b>	4.9	9.9	<b>3.45</b>	43.5	21.7	43.5	22.2	
24	<b>34.7</b>	17.3	34.7	<b>9.8</b>	4.8	9.8	<b>3.56</b>	43.7	21.9	43.7	22.0	
23	<b>35.1</b>	17.5	35.1	<b>9.6</b>	4.7	9.6	<b>3.66</b>	44.0	22.0	44.0	21.9	
22	<b>35.5</b>	17.7	35.5	<b>9.4</b>	4.6	9.4	<b>3.77</b>	44.2	22.1	44.2	21.7	
21	<b>35.9</b>	17.9	35.9	<b>9.2</b>	4.5	9.2	<b>3.88</b>	44.4	22.2	44.4	21.6	
20	<b>36.3</b>	18.1	36.3	<b>9.1</b>	4.5	9.1	<b>4.00</b>	44.7	22.3	44.7	21.4	

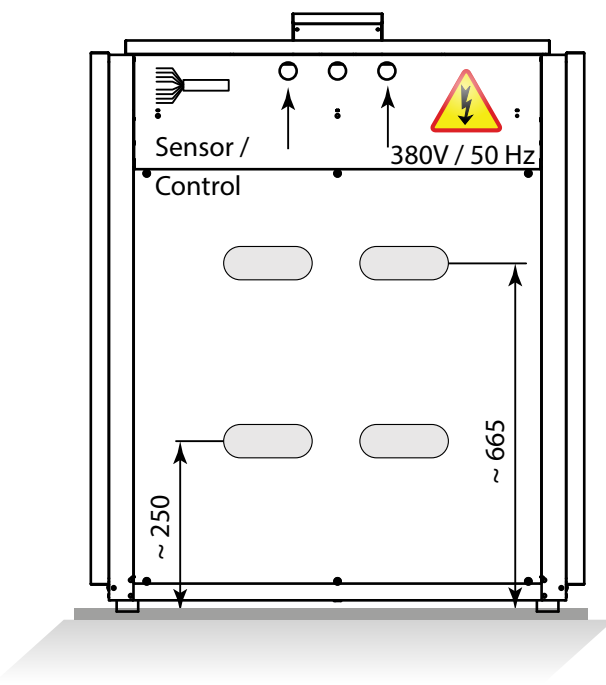
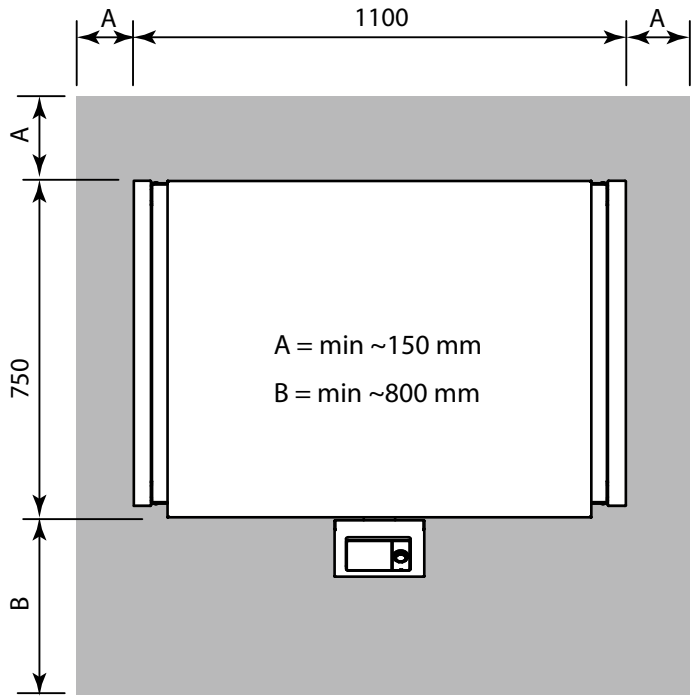
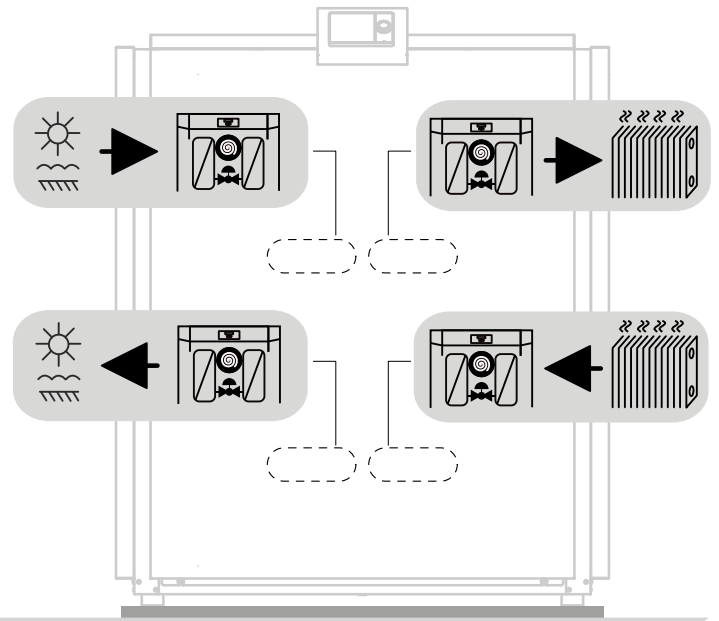
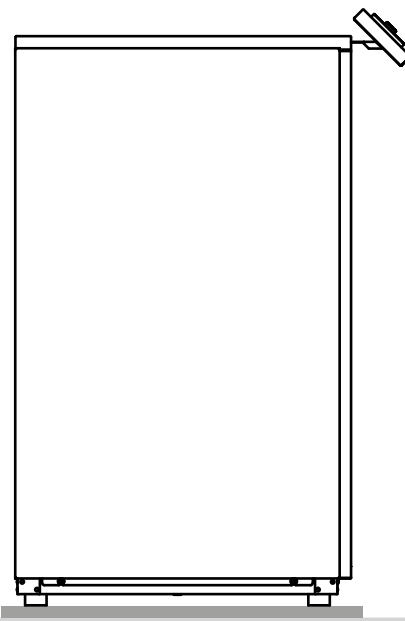
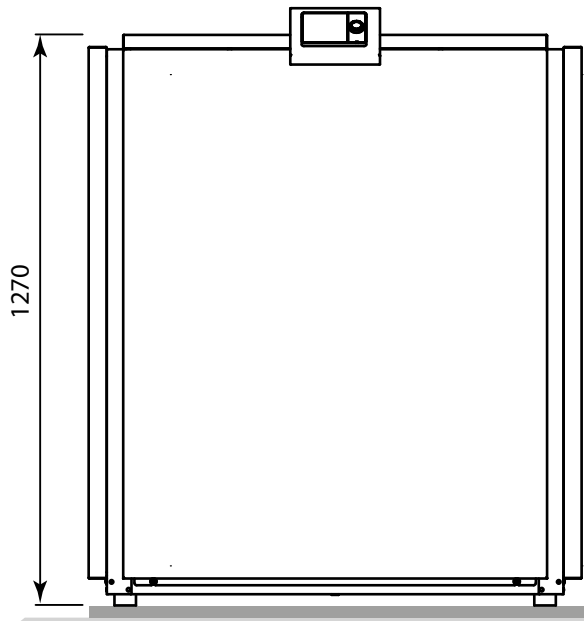
Tc [°C]		W 23 / 18 °C										
0	Qc nom	Qc min	Qc max	Pin nom	Pin min	Pin max	EER	Qh nom	Qh min	Qh max	I nom	
[°C]	[kW]	[kW]	[kW]	[kW]	[kW]	[kW]	kW / kW	[kW]	[kW]	[kW]	[A]	
40	<b>42.9</b>	21.4	42.9	<b>13.3</b>	6.5	13.3	<b>3.23</b>	55.3	27.6	51.4	25.9	
39	<b>43.5</b>	21.7	43.5	<b>13.0</b>	6.4	13.0	<b>3.34</b>	55.7	27.8	51.8	25.6	
38	<b>44.1</b>	22.1	44.1	<b>12.7</b>	6.3	12.7	<b>3.46</b>	56.1	28.0	52.2	25.3	
37	<b>44.7</b>	22.4	44.7	<b>12.5</b>	6.1	12.5	<b>3.58</b>	56.5	28.2	52.6	25.0	
36	<b>45.4</b>	22.7	45.4	<b>12.2</b>	6.0	12.2	<b>3.70</b>	56.9	28.4	53.0	24.8	
35	<b>46.0</b>	23.0	46.0	<b>12.0</b>	5.9	12.0	<b>3.83</b>	57.3	28.6	53.3	24.5	
34	<b>46.6</b>	23.3	46.6	<b>11.8</b>	5.8	11.8	<b>3.95</b>	57.6	28.8	53.7	24.3	
33	<b>47.2</b>	23.6	47.2	<b>11.5</b>	5.7	11.5	<b>4.08</b>	58.0	29.0	54.1	24.0	
32	<b>47.7</b>	23.9	47.7	<b>11.3</b>	5.6	11.3	<b>4.22</b>	58.4	29.2	54.5	23.8	
31	<b>48.3</b>	24.2	48.3	<b>11.1</b>	5.5	11.1	<b>4.35</b>	58.8	29.4	54.9	23.6	
30	<b>48.9</b>	24.5	48.9	<b>10.9</b>	5.4	10.9	<b>4.49</b>	59.2	29.6	55.3	23.4	
29	<b>49.5</b>	24.7	49.5	<b>10.7</b>	5.3	10.7	<b>4.63</b>	59.6	29.8	55.7	23.2	
28	<b>50.0</b>	25.0	50.0	<b>10.5</b>	5.2	10.5	<b>4.77</b>	60.0	30.0	56.1	23.0	
27	<b>50.6</b>	25.3	50.6	<b>10.3</b>	5.1	10.3	<b>4.91</b>	60.3	30.2	56.5	22.8	
26	<b>51.2</b>	25.6	51.2	<b>10.1</b>	5.0	10.1	<b>5.06</b>	60.7	30.4	56.9	22.6	
25	<b>51.7</b>	25.9	51.7	<b>9.9</b>	4.9	9.9	<b>5.21</b>	61.1	30.5	57.3	22.4	
24	<b>52.2</b>	26.1	52.2	<b>9.8</b>	4.8	9.8	<b>5.36</b>	61.5	30.7	57.6	22.2	
23	<b>52.8</b>	26.4	52.8	<b>9.6</b>	4.7	9.6	<b>5.51</b>	61.8	30.9	58.0	22.0	
22	<b>53.3</b>	26.7	53.3	<b>9.4</b>	4.6	9.4	<b>5.67</b>	62.2	31.1	58.4	21.9	
21	<b>53.8</b>	26.9	53.8	<b>9.2</b>	4.5	9.2	<b>5.83</b>	62.6	31.3	58.8	21.7	
20	<b>54.3</b>	27.2	54.3	<b>9.1</b>	4.5	9.1	<b>5.99</b>	62.9	31.5	59.2	21.6	

-- 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





int. code: VN1100

